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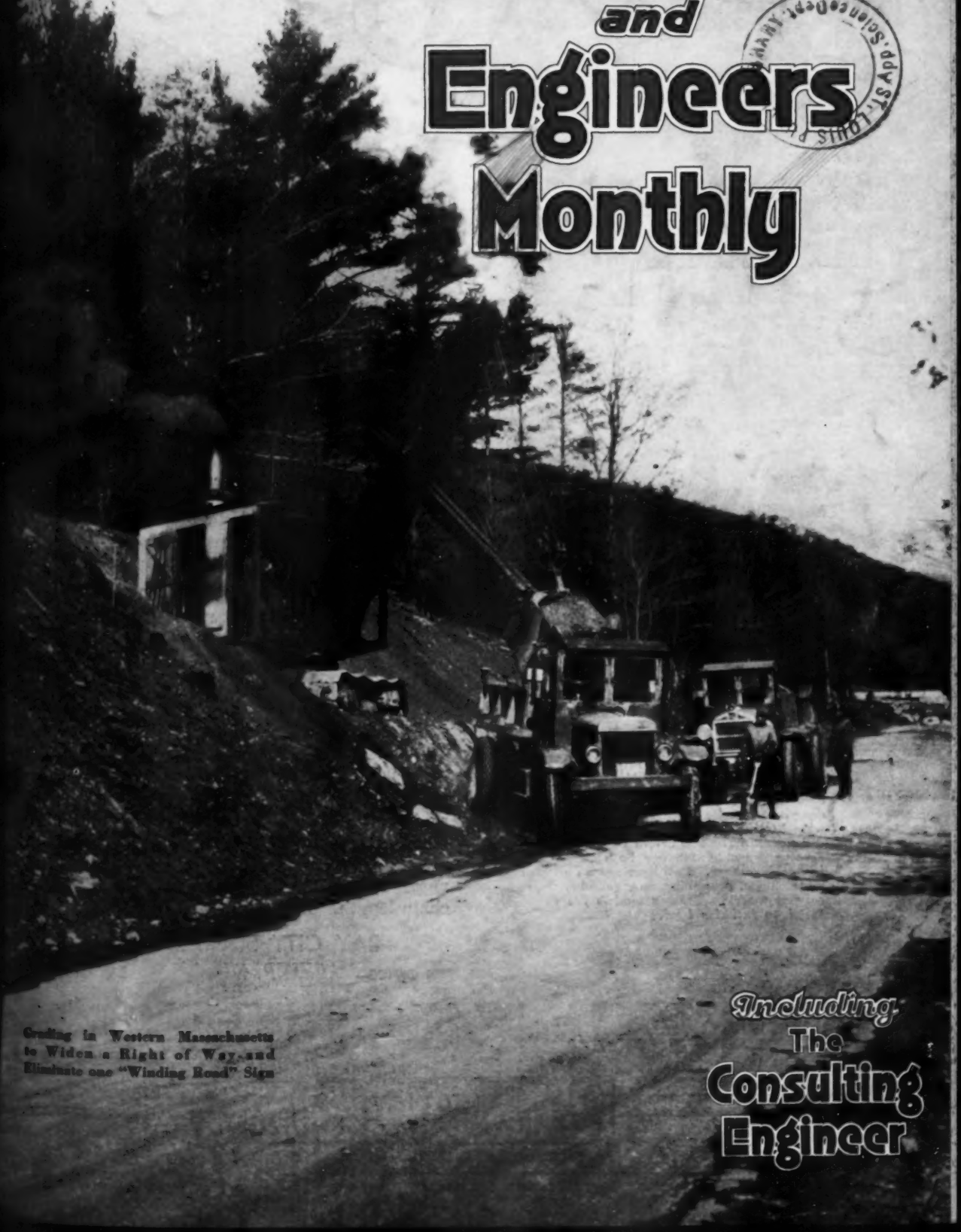
Contractors and Engineers Monthly



Grading in Western Massachusetts to Widen a Right of Way and Eliminate one "Winding Road" Sign

Including The Consulting Engineer

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The Ground Work of a B. S. T. M. Job

Longitudinal Straight-Edging and Hand-Filling of the Top Course

York Engineering & Construction Co., York, Pa., Built Heavy-Duty Waterbound Macadam Highway South of the Famous Gettysburg Battlefield

MOTOR traffic into Gettysburg, Pa., is heavy at all times of the year for the historic associations of the famous Civil War battlefield create a perennial magnet for American tourists from all parts of the United States. The fascination of the battleground is well maintained by the Pennsylvania State Commission which keeps the surrounding country well groomed and retains a trained group of guides who accompany visitors on a 2½-hour tour of the three-day battlefield, vividly portraying the events of those stirring days.

To one who has studied this famous battle, "Round Top" means much and it is from this site that the 29,189-foot B. S. T. M. project started and continued south to the Maryland line. The York Engineering & Construction Co., York, Pa., was awarded the contract for this bituminous surface-treated macadam job 18 feet wide and built with a 9-7-9-inch cross section similar to the concrete roads now under construction throughout Pennsylvania. They handled all of the grading and the placing of the crushed stone, the final bituminous treatment being done by State forces.

Grading

Most of the project was over the old right of way, but a number of sharp curves were removed or widened so that considerable heavy excavation was necessary. For this work, an Erie ¾-yard steam shovel and a Marion 1-yard steam shovel were used, with five motor trucks doing the handling from each shovel, an average

distance of 3,000 feet. The trucks, mostly Macks and Whites, were hired by the hour from local operators. The maximum cut on the job was 14 feet and the maximum fill 8 feet.

As considerable rock was encountered two I-R compressors with jackhammers were used to drill holes up to 10 feet in depth. The contractor endeavored to shoot the entire depth of rock cut at one time, but was forced during part of the work to resort to two lifts. Du Pont 60 per cent gelatine dynamite was used for the blasting.

The shovel crews consisted of the shovel man, a fireman and two pit men for each shovel. Practically all of the rough grading was handled by two laborers and two Caterpillar Thirties equipped with bulldozers. On the fine grading, a Caterpillar Sixty with a 10-foot Ryan blade grader was used with about 26 laborers to do the final hand finishing.

LAYING THE BASE COURSE

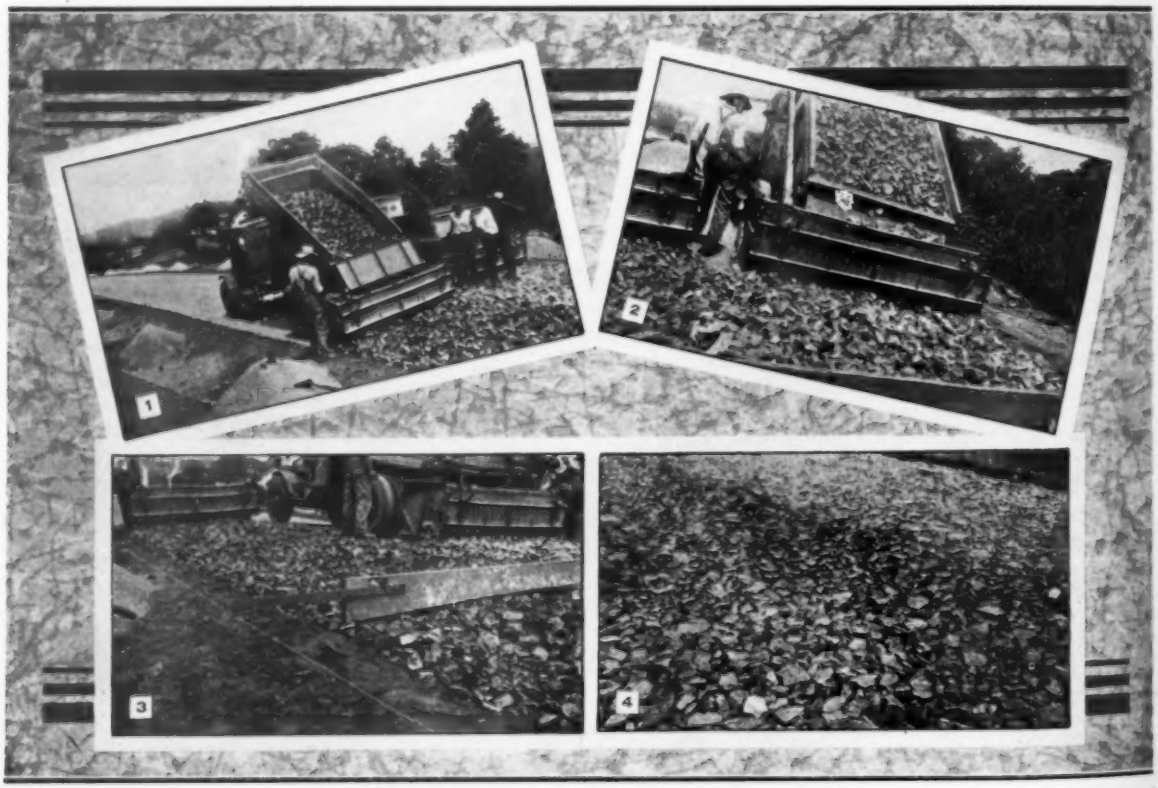
Stone was hauled 12 miles from the Jingle quarry by the producer and was spread on the road directly from the trucks in an initial 6-inch layer by means of two 9-foot Burch spreader boxes. The stone which ran from 1¼ to 4 inches in size was carefully inspected and loads in which there was much stone over 4 inches were rejected. All stone placed on the road was hand-culled. There were four laborers on each of the spreader boxes with a foreman in charge and immediately behind them came a man with a crown board and 2-foot spirit level which was put on a strip nailed to one side of the board. An extension from the end of the board to the grade line made it possible to place and trim the stone to contour and to keep the grade board level. This stone was rolled immediately by a 10-ton Buffalo-Springfield steam roller, the layer being gone over continuously with the contour board to insure its being compressed uniformly.

The second layer or 3-inch top was then placed with the spreader boxes and kept to the proper contour during rolling by two additional men using the straight-edge. Not only was the cross-section of the road maintained true by the contour board, but the board reversed was used as an 18-foot straight-edge placed longitudinally on the road to show up any depressions or high spots, which were filled or removed by hand.

Following the second compression a crew of twelve men spread screenings uniformly over the surface by hand, carrying it by shovel from piles spotted on the shoulder. The 10-ton steam roller used for this work was equipped with a gang of street brooms at the back which spread the screenings into the top so as to secure a uniform surface for the eventual bituminous binder. This work was likewise contoured and straight-edged by two men.

GROUTING

The contractor maintained a uniform output of about 1,200 feet of base per day or 1,300 feet of top. On the day following the completion of the top, this macadam was grouted by applying water from two tank trucks and rolling with one of the 10-ton steam rollers. Men with a light truck and additional screenings were kept



SPREADING STONE FOR THE MACADAM BASE

1. Truck with Burch rock spreader attached laying down the 3-inch top course. 2. Close-up of the spreader in action. 3. Using the contour board to give proper shape and grade. 4. The top course rolled and ready for the application of the stone screenings.

Rolling the Top with a 10-Ton Roller Using a Gang of Street Brooms to Spread the Hand-Cast Screenings. The Roller Is Approaching, Hence the Slight Ridge of Screenings in Front of the Brooms

busy in the grouting area, filling up any voids.

The water for the rollers and for the grouting was pumped from a creek with an Austin gas pump and then hauled over the grade. So severe was the drought in this section of Pennsylvania that at one time toward the end of July it was feared that all of the operations would necessarily be shut down because the creek had been pumped practically dry. Two 600-gallon tank trucks supplied the water, hauling it from the pump to the grade.

PERSONNEL

The grading of this project was started on March 16, 1930, by the York Engineering & Construction Co., York, Pa., under the direction of W. J. Morton, Superintendent. The laying of stone was started on May 17 and the whole job was completed early in September. For the State Department of Highways of Pennsylvania, "Doc" Siebert was Chief Inspector.

Kentucky Slips Back Into "Unclassified Excavation"

THE State Highway Commission of Kentucky late in January issued an order that, after February 25, all road work advertised would call for bids on unclassified excavation instead of earth excavation and solid rock excavation, thus relieving its engineers of the responsibility of differentiating between rock and earth.

Formerly, contractors were bidding on solid rock excavation and common or earth excavation which includes everything in the nature of roadway excavation except solid rock and they were paid for their work accordingly. There is very little relation between the work of handling common excavation and solid rock excavation and certainly there is a considerable difference in cost. According to the *Scraper*, published by the Kentucky Association of Highway Contractors, the Commission realized this when it refused to accept a bid in the past carrying the same price for both items. Prior to February 25, 1931, contractors were bidding less than half as much on common excavation as on solid rock, showing that they, too, realized a decided difference in cost.

In most progressive states every effort is made to show the prospective bidders the various kinds of materials to be excavated and the approximate quantities, so that when dirt excavation is encountered, the contractor will be paid for dirt and where rock is met, he will be paid for rock. This is fair to the contractor and to the owner, whether it be a corporation or a state highway department. If this order of the State Highway Commission of Kentucky remains in effect, it will add another gamble to the contractor's bid, which will mean a windfall for him if he puts in a fair bid for "unclassified excavation" and hits 90 per cent earth, but quite the contrary if the earth turns out to be merely an overburden for a good husky ledge.

Keep Convicts Off the Roads

WHILE Congress is considering legislation to protect American labor by prohibiting the importation of the products of convict, forced or indentured workmen, the Associated General Contractors of America is organizing a movement to protect American free labor further by having domestic prison labor entirely withdrawn from all competitive fields and its energy directed to the rehabilitation of the natural resources of the country.

Colonel George B. Walbridge of Detroit has suggested the use of convicts in the rehabilitation of worn-out farm lands and the reforestation of barren timber lands and thus withdraw prison labor from all competition with free labor. This movement is the outcome of an extensive study by the Association of penal conditions and of the serious inroads that the utilization of convicts is making in private industry, especially as it affects highway contractors on public construction. Realizing the necessity for some useful employment of the large prison population, contractors are putting forth a plan which they claim will build up immense national resources and will in no way be a menace to private industry and free labor.

It is believed that the nature of this work should be especially conducive to the rehabilitation of the prisoners themselves and that the plan offers a sensible solution of both the humanitarian and economic problems involved in penology. Sponsors of the plan point out that there are thousands upon thousands of acres of cut-over timber land and depleted farmland throughout the country which are of negligible value at present, but which can be economically developed into valuable assets within a few years under this plan.

There is an ever-increasing surplus of labor in the United States and there seems to be no likelihood of any industry absorbing this surplus, especially if American workers have to compete with convict labor. In every instance where prison labor is utilized in competitive fields, both private business and free labor are forced to compete against arbitrary and false assumptions of costs that are established by the prison labor bureaucracies. This results in the tearing down of wage standards, increased unemployment and injury to business generally.

Electric Welding Costs Actually Below Riveting Costs

AFTER several years of experience in noiseless steel construction by electric welding, the Austin Co., engineers and builders, Cleveland, Ohio, has found for the first time in building history that its cost of this type of construction, is now below that of the older riveted types. Increased demand for noiseless building has stimulated research as well as the volume of such buildings with the result that costs have been brought sharply lower.

In discussing this important announcement, W. J. Austin, President, says, "There are many important advantages in this modern type of construction which promises to become the prevailing method for many classes of building in the future. Among these advantages, in addition to the fact that it is noiseless and now costs less, are the neater appearance of welded steel, the elimination of bulky connection plates, greater speed in construction, elimination of fire and accident hazards of hot rivets, greater strength and rigidity and a reduction in the tonnage of steel required in a building."

Four Methods *of* Handling Concrete

By
Thomas E. Stimson, Jr.

FOUR different methods of transporting and placing concrete were employed by H. W. Rohl & Co., General Contractors, Los Angeles, in expediting the construction of the tunnel portions of the Figueroa Street extension project now reaching completion in Los Angeles. The extension is part of a plan to provide an additional main traffic artery connecting down-town Los Angeles with the northeast section of the city.

Three tunnels, the most interesting part of the present work, carry the roadway on a uniform grade through a series of hills under Elysian Park. The road from the most northerly of the tunnels extends along the side of a steep hill to connect with an existing bridge crossing the Los Angeles River channel. The outer edge of the roadway along the hill will project over and will be supported by reinforced concrete columns and girders.

Chuting Concrete Through an Upper Adit into the Center of the Figueroa Street Tunnel in Los Angeles

The tunnels, beginning with No. 1 at the south, are respectively 461, 130 and 405 feet long, a total of 996 feet. All of the tunnels are of the same size, having a clear span inside of 46.5 feet and a clear height of 28.25 feet. They are lined with reinforced concrete, from a minimum thickness of 2 feet at the crown of the arch to 6.75 feet at the bases, there being a total of 16,912 cubic yards of concrete in the tunnels.

Contractor's Plant

Due to the fact that the central portions of the project were inaccessible by road before construction was started, the contractor erected his entire plant at the north end of the line of tunnels, partly on ground that had been cut to grade and partly on the hillside below the grade of the work.

A Madsen steel batching plant, containing five bins was erected below the level of the roadway so that material trucks could back directly onto a platform and dump into the bins. Two Smith 28-S mixers were set up under the batching plant on the hillside. These were equipped with Smith water-measuring tanks with siphon cut-offs. Cement storage sheds were on a level with the mixing platform. An Insley steel hoisting mast was erected alongside the mixers. A compressor plant consisting of three large Sullivan machines was contained in a building adjoining the mixers, these compressors ranging in capacity from 376 to 967 cubic feet.

This plant overlooked the yards of the Southern Pacific Railroad at the base of the hill. A large wooden chute was constructed from the roadway level to the base of the hill, the bottom of the chute being directly over one set of railway tracks. All excavated material from the tunnels with the exception of a small amount used for a fill was transported to this chute and discharged into railway cars. The railroad, having use for the material in constructing fills along its own lines, spotted the cars and hauled the spoil away.

Working the Drifts

Work was started at the north portal of Tunnel No. 3, immediately adjacent to the plant. Preliminary work, after the face of the hill had been cleared, was carried on from three drifts, one drift being under the center of the crown of the tunnel and one at either side of the base of the arch. Because the hill consisted of very badly shattered and broken sandstone, it was necessary to heavily timber the drifts. Material was disposed of by means of small industrial railways consisting of Koppel chassis on which Huber bodies were mounted and operated by steel cables hitched to an American electric hoist outside the work. Since the

on a Los Angeles Tunnel Job

grade of the work was from south to north, the filled cars in the lower drifts were run by gravity to the chute above the railroad yards, being returned empty by the cables. In the case of the upper drift, the loads were dropped from the face and were later removed by truck.

Excavation for the footings and walls of the tunnel was made by cutting through from each drift, leaving a huge core on the inside of the tunnel. Steel H-ribs consisting of short sections bolted together were used to support the roof of the tunnel, and were left in place as a permanent reinforcement to the concrete. The tunnel core was used as a support for the concrete forms until the concreting had been completed, and was then broken up by blasting and was moved by a quarter-crowd Northwest shovel and trucks.

Placing the Concrete

Pouring was started at the south end of the tunnel, working back down the grade. Concrete was chuted from the hoisting mast at the mixing plant via a pipe cut through the hillside to a point near the middle of the tunnel. The chute discharged into a hopper, which in turn placed the concrete in the mine cars. The concrete was then placed by gravity as high as practicable. One industrial track was laid along each side of the crown, there being a five-car train on each track. The filled cars were hauled to the top of the grade, and as pouring progressed north, each car in turn was spotted at the placing tremie, the train backing by gravity. Concrete for the roof portion of the tunnel above the grade of the cars was shot into place with two Ransome air guns, each having 6-inch discharge.

The work in the interior of the tunnel precipitated three slides on the north face, making it necessary to pour the north portal and the adjoining 45 feet of tunnel after the core had been removed. Fan-shaped scaffolding, supported at the base on concrete blocks, was used to carry the forms for this portion of the structure. Concrete was poured directly into place by chuting from the hoisting mast.

Work on the Center Tunnel

The shore center tunnel was planned originally as a bore, but because the cover earth would have been so shallow as to make tunneling impractical, permission was obtained to make an open cut, provided that the former contours of the hill were re-established after the tunnel had been completed. The cut was made with two Northwest shovels, trucks disposing of the material at the railroad chute as described above.

At this stage of the work, the pouring of concrete having been completed in the first tunnel, a hopper was erected alongside the hoisting mast at the mixing plant, so that trucks could back under the hopper to load with concrete and carry it to the other tunnels. Specially-designed truck bodies were used, the trucks climbing partway up the hill through which the open cut had been made, so that all of the concrete in the second tunnel, except for the portals, could be placed by gravity. The upper portions of the portals were too high to be reached by this method, and the remainder of the pouring was accomplished by using a clamshell to lift the concrete from the trucks.

The truck bodies mentioned above were fabricated at the contractors' shops from designs by H. W. Rohl. Each truck consists of a Sterling chassis with a dump hoist, carrying a 4-yard sheet metal body with a flanged-in upper portion, having a splash board across the back and a 15-inch tail gate. The narrowing of the body toward the rear insures the removal of all concrete when the hoist is operated. The narrow tail gate makes it possible to pour small individual amounts of concrete into buckets or hoppers.

Completing Tunnel No. 1

Excavating, reinforcing and form work in the last

Interior of No. 3 Tunnel, Near the Crown of the Arch, After the Lower Drifts Had Been Cut Through to the Upper Drift, Showing the Typical Use of Steel H-Beams for Supporting the Roof

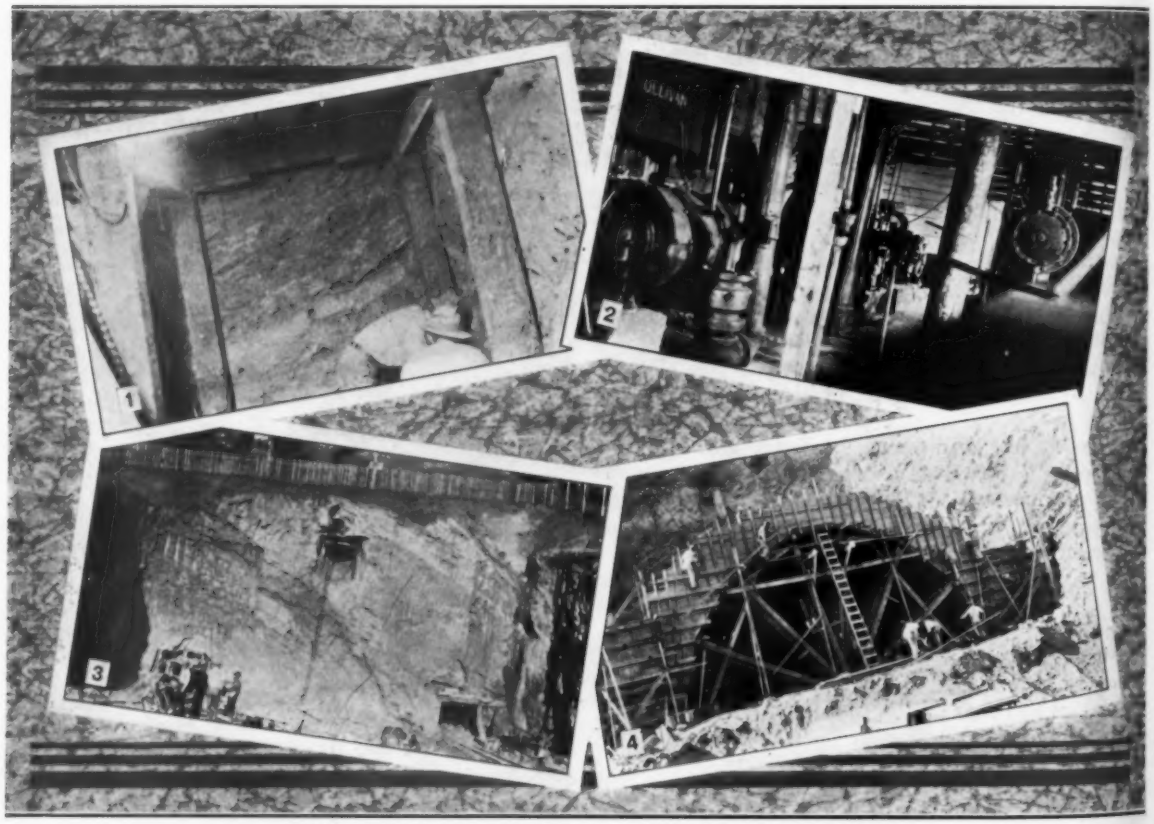
One of the Specially Built Truck Bodies Showing the Small Tail Gate for Releasing Small Quantities of Concrete

tunnel, No. 1, were carried on similarly to the methods used in the construction of the first tunnel. In this case, however, a steel mast was used to lift the concrete from the trucks, instead of the clamshell that had been used for the smaller pour in the center tunnel. This mast consisted of the upper half of the original steel tower at the mixing plant, the full height of that mast having served its purpose when the pouring of the north tunnel had been completed. The concrete trucks dumped directly into a 2-yard hopper at the base of the mast, and the concrete was carried to mine cars spotted on a platform extending past the face of the upper drift.

QUANTITIES

Construction was started late in April, 1930, the contract calling for completion on July 1, 1931. Features of the work aside from the tunnels include paving the tunnels and some 850 feet of outside roadway with 8-inch concrete, two pedestrian subways, ornamental stone railing, ornamental lighting, and other details.

Some of the approximate quantities involved include 130,000 cubic yards of excavation, of which 58,000 cubic yards are in the tunnels, 184,531 square feet of 8-inch concrete pavement, 2,798 square feet of 6-inch concrete pavement, 692,340 pounds of reinforcing steel in tunnels and structures, 22,344 square feet of cement sidewalk, and 4,757 lineal feet of curbing. Contract price for the job was $652,780.50. Benjamin Wells is Superintendent for H. W. Rohl & Co., contractors, and Bert D. Bassett is Resident Engineer for Los Angeles.



OPERATIONS ON TUNNEL No. 3 UNDER LOS ANGELES

1. Pushing the heading of a drift. The condition of the material necessitated timbering immediately behind the excavation. 2. Interior of the compressor house, showing the compact set-up. 3. Early stages, showing three drifts broken through the south end. These drifts had been connected inside the hill and pouring of the concrete had started. 4. The fan-shaped scaffolding supporting the forms for the north portal of the tunnel.

Getting the Business Facts *in* Contracting

By

J. E. Gregory, C. P. A.

Farrington, Hyland & Gregory
Certified Public Accountants
New York City

CONTRACTOR SMITH had been called to account by Banker Jones. He had just returned from the conference and inwardly admitted to himself that Jones had certainly put him through the third degree. Smith had always prided himself upon knowing his business, and knowing it well, but he could not answer offhand the banker's questions relating to the facts of his business, a matter which sorely annoyed him, so he proceeded to take it out on old Hawkins, his bookkeeper, who had so diligently prepared the financial statement that had occasioned the banker's cross examination.

This is one of a series of twelve articles appearing monthly during 1931 *covering tax, accounting and system problems as applicable to the contractor.*

Particular problems relative to either accounting, systematization or tax matters may be directed to the offices of Farrington, Hyland & Gregory, Certified Public Accountants, Chrysler Building, New York City, or to CONTRACTORS AND ENGINEERS MONTHLY, 470 *Fourth Avenue, New York City.*

"Hawkins, that statement you prepared for the bank may be correct, but it certainly needs an analytical genius to derive from it the answer to some matters that Banker Jones has just put to me. Jones admitted that the statement looked all right as far as a summary of finances was concerned, but stated that it did not reveal the amount of indebtedness due and owing, as it applied to the jobs we are running. This sounds like poppycock to me but I suppose we will have to dig out this information and get it over to the bank before closing this afternoon. Can you do it?"

Hawkins was stumped. He knew it. He knew the records he kept did not make a dual segregation of liabilities, first as to the creditors or subcontractors owed and secondly as to the jobs the money was owed upon. He had never sensed the necessity of keeping these facts by jobs, as in ordinary mercantile business houses the only requisite was to know just who was owed and how much was owed. Fools—these bankers!

However, Hawkins wiped his glasses, adjusted his green eye-shade, sharpened a half-dozen pencils and went to work. What a job! He had shown on his statement to the bank the following:

Due to Creditors	$46,500.00
Due to Subcontractors	67,500.00

He knew there were only three jobs in progress, the X Highway, the R School and the D Residence. He knew that he would have to segregate the balances he reported to the banker, representing a matter of sixty creditor and subcontractor accounts as between these jobs. These balances were built up from charges and credits ranging over the past eighteen months, each charge and each credit of which must be applied to the job to which it belonged. Yet it had to be done.

Five days later, after nights of work and the constant haggling criticism of the boss who, in turn was being admonished by the banker, Hawkins presented his complete analysis to Contractor Smith. In summary, and with permission, we present it:

	Creditors	Subcontractors
Due for Administrative Items	$3,200.00	
Due on S Apartments Job	13,500.00	$7,500.00
Due on B Church Job	10,200.00	9,800.00
Due on X Highway Job	5,100.00	10,000.00
Due on R School Job	6,500.00	16,700.00
Due on D Residence Job	8,000.00	23,500.00
	$46,500.00	$67,500.00

Smith looked it over, tapped his desk with a pencil stump, looked hard at Hawkins, started to blow up and then thought better of it.

"Hawkins, old fellow, what a donkey I am and what a fossilized old mink you turned out to be. I realize now just why Banker Jones wanted this information and I hope you do, too. Just look at this statement you have given me summarizing my debts. Why that S Apartments job was completed at least seven months ago and the Church job has been done a matter of over nine months. If your figures are right, I owe $21,000 on the Apartment job and $20,000 on the Church job, both of which represent creditors who should have been paid from the proceeds of those jobs as the funds were received. We have received our final payments on those jobs months ago. Why didn't you let me know this condition before? From now on, Hawkins, not only do

I want to know just whom I owe but I want to know on what jobs I owe, and if you can't get it for me without all the fuss attendant upon this last work, you know what I'll have to do."

So Hawkins thought it over. How could he arrange his accounts and subcontractors payable ledger so that it would make available at all times the information that was required.

Here was a solution worked out with some assistance. It may be of help to some other fellow:

He installed a loose leaf Payable Ledger using three indexes for three groupings. The first group represented Accounts Payable—Administrative Creditors, the second group Accounts Payable—Job Creditors, the third group Subcontractors Payable. The ledger sheets for the first group—Administrative Creditors, were the ordinary ledger debit and credit ruled affairs, but the ledger sheets designed to handle Job Creditors and Subcontractors Payable were ruled as follows:

Creditor or Subcontractor.....
Address.....

Date	Explanation	Folio	Job X	Job R	Job D	Job Totals
Jan. 21.....	Balance		$3,400	$2,700	.....	$6,100
Jan. 24.....	Car No. 22167	V 27	1,200	1,000	$1,500	3,700
Jan. 31.....	Check No. 492	C 31	1,500	1,500	300	3,300
Net Amounts Due.....			$3,100	$2,200	$1,200	$6,500

Credits, representing purchases or requisitions received from Subcontractors are entered in black and checks and other forms of payment or debit adjustments are entered in red. Just from the above account alone it is evident that out of a total amount of $6,500 owed to Creditor ———— at January 31, there was $3,100 due on Job X, $2,200 on Job R and $1,200 on Job D.

And so this problem was solved by Hawkins, with assistance, who had still much more to learn about obtaining the contracting facts.

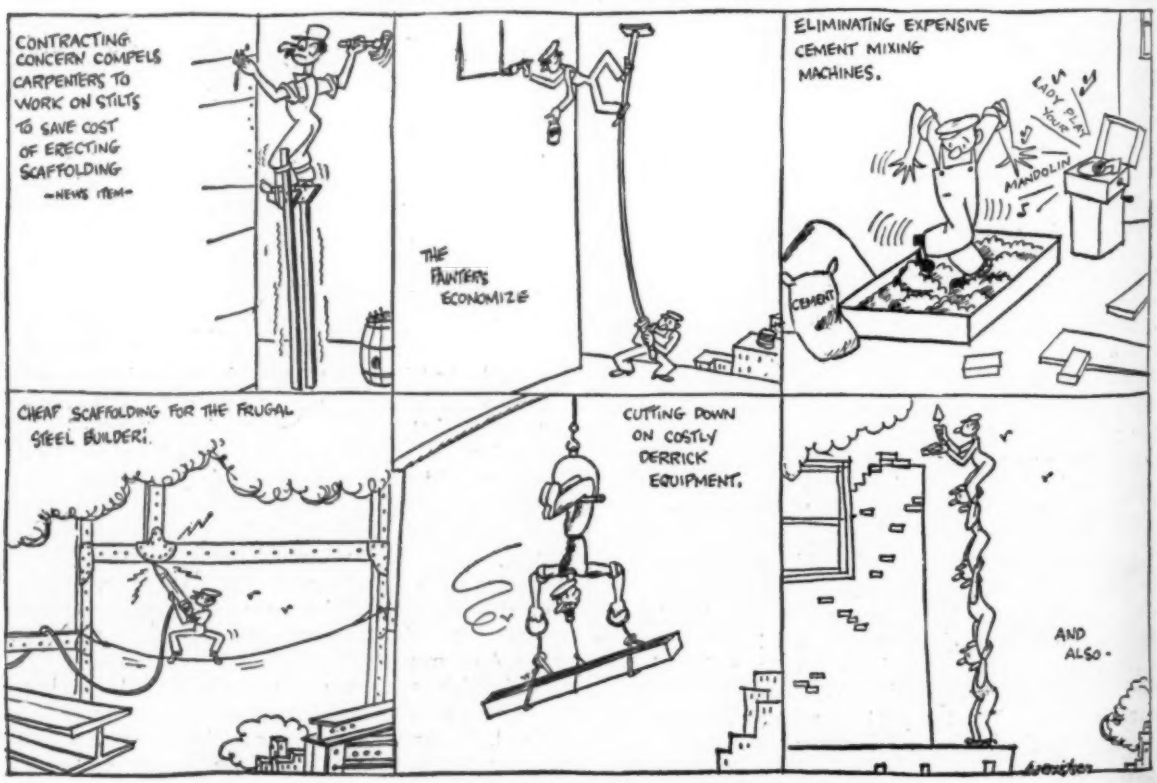
Connecticut Contractor Built New Hampshire's Longest 1930 Concrete Road

THE longest stretch of concrete highway laid in the State of New Hampshire in 1930 was from Bethlehem to Twin Mountain through Carroll, a total distance of 7.71 miles. The Arborio Road Construction Co., Hartford, Conn., was the contractor for this work. Clearing for the project started on May 8, concreting started July 1 and was continued to September 6, with the entire job completed on September 30. The total number of working days consumed was 114, of which 50 were required for concreting. The contractor thus laid a mile of completed road in a little better than 15 working days, which is considered a good average for this section of the country, according to *The Nerba*.

The concrete slab was 20 feet wide, except for a distance of 3,500 feet in Bethlehem where the width varied from 20 to 23 feet. The middle 16 feet of the slab was laid 6 inches thick and the balance tapered from this to 9 inches at the outer edges. A 1:2:3½ mix was used requiring a total of 90,800 sacks of Dragon portland cement. The road was opened to traffic 7 days after concrete was laid, tests by the laboratory of the State Highway Department showing that the concrete had developed ample transverse or beam strength in that period. Concrete aggregates, both sand and gravel, were of excellent quality and were obtained from pits alongside the job.

John Diminutto was the superintendent for the contractor on this job C. M. Brooks was Division Engineer and D. A. Proctor, Resident Engineer for the State Highway Department.

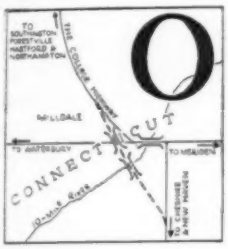
A New Series of Cost Cutters



"Help for the Contractor" by Haenigsen. Published by permission.

River *and* Highway Bridges Eliminate *a* Traffic Hazard

A 75-foot Pile Driver and Compact Concreting Plant Used by J. F. Kelly Construction Company to Complete Dual Structures



ON the College Highway, a heavily travelled State Route between New Haven, Conn., and Northampton, Mass., there existed a dangerous right angle turn at the foot of a long steep hill immediately followed by a second right angle turn at Milldale, Conn. Between the two turns, a second heavily travelled road between Waterbury and Meriden complicated the traffic situation and greatly increased the hazard. To overcome this, State Highway Commissioner John A. Macdonald called for bids for the construction of 1,360 feet of fill and two concrete bridges. The first bridge crosses a small creek known as Ten-Mile River and the second is an overpass for the College Highway where it crosses the Waterbury-Meriden Road. The trolley track on the Meriden-Waterbury Road was dropped about 4 feet to permit a better grade on the College Highway.

The J. F. Kelly Construction Co., West Haven, Conn., the low bidder, was awarded the contract. The cost of this project, including the contractor's bid prices and cement and other material furnished by the State, and the piles which it was found necessary to put under the overpass, amounted to approximately $100,000.

Fill and Excavation

Fill and excavation were started on June 2, 1930 by the subcontractor, Julius Varvello of New Haven, using a ¾-yard Erie steam shovel. The geological conditions in this area created unusual construction problems. The early State Highway Department records which were made during the construction of the bridge over Ten-Mile River on the Waterbury-Meriden Road showed ledge, but when work started on the excavation at the overpass, no rock was encountered. Instead there was clay in which the shovel became mired and an entire month was lost. It was necessary to lay a rubble drain and ditches were dug to dry out the clay. Following this, the shovel was put to work again but with planking to insure its safety.

When excavation began for the river crossing, the ledge was struck, in spite of the fact that this was only 250 feet from the grade crossing. The excavation brought out the fact that a geological fault existed at this point and that the river was running on the high point of the ledge. The brown sandstone was broken out with jackhammers operated by an Ingersoll-Rand portable compressor and no explosive was used.

A Universal crane with a ½-yard clamshell was used to assist in excavating the clay which was wasted or used around the foundation of some of the houses in the vicinity which had to be moved and new foundations prepared, outside of the new right-of-way. The rock

The Concreting Plant Showing, from Left to Right, the Cement House, the Concrete Tower, the Bins and Mixer, the 75-Foot Pile Driver in the Background, and the P & H Crane

The Hercules-Powered Jaeger-Barnes Centrifugal Unwatering the Open Caisson at the River Bridge

from the excavation was used in the 1,360-foot fill. The remainder of the fill was made with gravel borrow which was hauled ¼-mile by the excavating contractor, Julius Varvello. The fill amounted to about 12,000 yards.

Details of Work at the River Crossing

In order to be able to place the concrete in the foundation at the river crossing in the dry, 3-inch wood sheathing was used with trusses in order to minimize the cross bracing. The sheeting was driven with an I-R sheeting hammer. The wings, which measured 20 x 30 feet, were all poured in the dry with 1:3:5 concrete. The wings were built as gravity structures while the arch of the river crossing was reinforced and poured with 1:2:4 concrete. The same mix was used on the abutments and on the highway bridge. The caissons were unwatered by a 6-inch Jaeger-Barnes centrifugal and a Homelite 4-inch centrifugal pump.

The river bridge was designed as a rigid structure with gravity wing walls and an elliptical arch with a 30-foot clear span and a 10-foot rise.

The Overpass

The road crossing is a rigid frame arch with a skew span 58 feet, 2⅜ inches clear. The contractor faced the problem of keeping the centering sufficiently open at all times to permit electric cars to pass. This was made possible by the use of heavy timber for the false work. Vehicular traffic was detoured.

The arch which was 1 foot 6 inches thick was supported by 12 x 12-inch beams spaced 2 feet on centers and with stringers measuring 2 x 6 inches spaced from 1 foot 10 inches to 1 foot 5 inches on centers. The posts were 6 x 6 inches with 6 x 10 caps and spaced 4 feet apart. All form lumber was 1¼ inches thick.

Pile Rig Built with 75-Foot Leads

Inasmuch as piles 60 feet long were required to give a stable foundation for the road crossing, it was necessary to have a pile rig with leads 75 feet long. As there were no rigs as large as this available at that time in the State, the contractor built one on the job. A McKiernan-Terry 10-B-2 steam hammer was used for driving the 220 piles. The pile rig with the steam pile hammer, roller and hoist weighed about 18 tons. It was moved forward and back on rollers and sideways by tackle attached to the ends of the rolls with four part blocks.

After the clay was found at the road crossing and it was definitely determined that it would be impossible to build the structure on a rock foundation, it was redesigned with reinforced concrete struts across the road supported by piles.

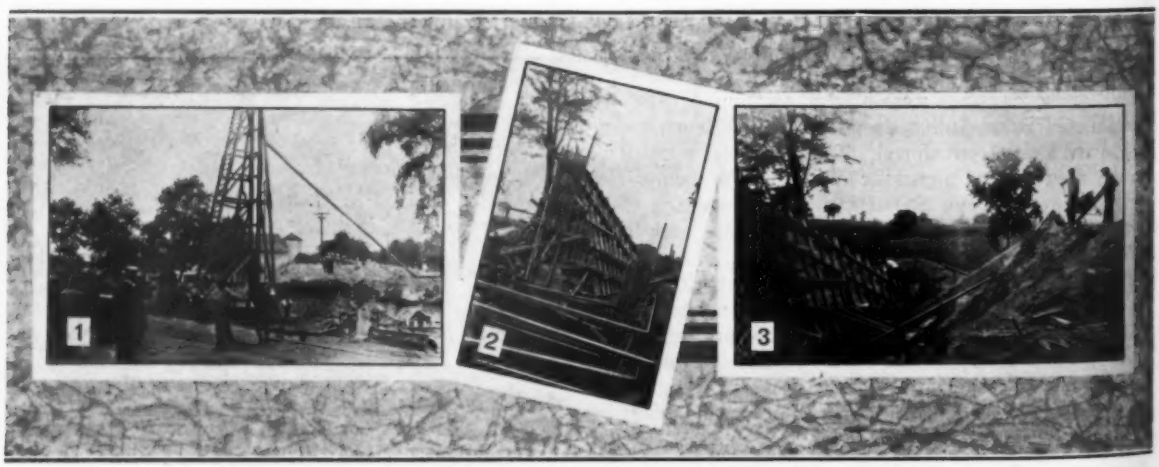
Concreting Plant

A total of 380 cubic yards of Class A, 1:2:4 and 504 cubic yards of Class B, 1:3:5 concrete was used in the road crossing structure. A total of 34,509 pounds of reinforcing steel went into the overpass, 30,365 pounds into the river bridges and 7,463 pounds in the subfooting and streets. In the substructure, 1:2:4 concrete was used.

The concreting plant, located midway between the river bridge and the roadway crossing, consisted of a P & H crane with a clamshell bucket which handled the sand and crushed stone from the storage areas to the Erie AggreMeter.

Stone was handled by truck from a quarry in Meriden, a distance of 10 miles, and sand was hauled in from Plainville, a distance of 8 miles. A Ransome

(Continued on page 80)



WORK OF THE J. F. KELLY CONSTRUCTION CO. AT MILLDALE, CONN.

1. *Pulling up a 60-foot pile to be driven for the support of one wall of the roadway bridge.* 2. *Forms ready for pouring a gravity wing wall of the river bridge.* 3. *Pouring the wing wall.*

Building *a* Big Irrigation Ditch *in the* Southern Idaho Desert

Shooting the Gunite into the Crevasses

By
I. K. Wilson

ONE of the biggest earth moving jobs in the West is the Gooding Project Canal recently built by the United States Bureau of Reclamation under an agreement with the American Falls Reservoir District No. 2. This canal was built for the purpose of carrying water from the American Falls Reservoir to the Wood River project which has suffered year after year from shortage of water. The total area of land which will be watered by this canal is estimated at 120,000 acres. The canal which is approximately 70 miles in length carries 3,700 second-feet of water. The water comes from the Snake River, the immediate storage being at the American Falls Dam.

Rock excavation was from Snake River lava, a formation that is very seamy and breaks into large blocks along the seam lines. Therefore it required heavy machinery and dragline excavators to handle the digging. The machines operating on the Gooding Project Canal were the heaviest ever used in Idaho.

Large Shovel and Dragline Operation

The contract for the construction of the first section, approximately 8,000 feet in length, was awarded to the Derbon Co., of Seattle, Washington. The contract called for the removal of 240,000 cubic yards of solid lava rock and 100,000 yards of other material, being mostly a mixture of rock and dirt. On this section they placed 5,000 yards of concrete in addition to shooting gunite into crevasses under high pressure to seal up possible leaks. All of the cement for the project was furnished by the Federal Government.

The Derbon Co. had a Marion Model-60, 2¼-yard steam shovel removing the rock after it has been drilled and blasted. A Bucyrus-Erie Model-B dragline lifted the rock away after the shovel had deposited it on the canal bank. A 2-yard Bucyrus-Erie dragline and another 1¼-yard convertible dragline also were used in this work.

The Derbon organization was also awarded the head works contract, including a steel bridge at a bid of $48,839. The steel truss bridge and steel gates at the outlet of the canal were included, and completed before January 1, 1931, working 24 hours a day in three shifts.

Work on the Second Section

The Winston-Wooden Co. had the second section of the first division, about 10,000 feet in length, which involved mostly dirt excavation with about one-eighth mile of rock. The shallowest part of this section was 14 feet and the deepest was 36 feet. This organization used a Monighan walking dragline with a 3-yard bucket which weighed 6,800 pounds and the machine itself weighed 150 tons. The Monighan dragline was op-

Curing the Gunite with Wet Sacks to Prevent Too Rapid Drying of the Concrete

erated by a crew of three men and moved from 750 to 1,000 yards of material on each 8-hour shift. Where the depth is 36 feet the canal is 50 feet wide at the bottom, with the banks sloping 1¼ to 1.

The John Phillips Co., of San Francisco, Calif., had schedules 1, 5 and 6 of the second division and operated two Bucyrus-Erie 50-B 2-yard draglines.

Mittry Bros., of Los Angeles, Calif., were the contractors on schedules 2, 3 and 4 of the second division. They used two 1-yard Koehring convertible shovels and a Bucyrus-Erie 175 dragline with a 7-yard bucket. The big cut at this part of the work was 60 feet deep at one point and averaged 44 feet deep for more than a mile. The boom on this machine was 125 feet long with an extension of 25 feet which could be added should it be needed to reach the bottom of the cut. The canal at this point is about 150 feet wide at the top. The Mittry contract included excavating earth and rock and the construction of certain concrete canal structures, diversion works, a waste way and a concrete flume. The total bid of Mittry Bros. for this diversified work was $1,339,000.

John Phillips' bid for earth and rock excavation and the concrete structure was $237,019. The cost of the nine schedules was $739,975.50. Of these Mittry Bros. were awarded five schedules, Phillips three, and Derbon, one.

The maximum time limit for the work was 670 days and the major part of it was completed in 265 days, with the possible exception of work of the Derbon Construction Co., which was an exceptionally difficult piece of excavation.

Details of Operation on the Derbon Contract

On this contract the Bucyrus-Erie Class 14 operated ahead in the ditch, taking out the initial cut in the rock and was followed up by the Marion 60 at the bottom of the cut, making the final clean-up and loading into 5-yard skips which were hoisted and dumped on the spoil bank by the Bucyrus-Erie 50-B acting as a crane. A P & H crane was used in stripping the light overburden from the rock. The yardage record was low because of the extreme difficulty of handling material so it can in no way be compared with ordinary rock excavation.

The fuel consumption on the Bucyrus-Erie 50-B averaged approximately 2 barrels of diesel oil per 24-hour day and for the Class 14 machine, 2½ barrels per day. The cost of the fuel oil delivered to the dragline was about 11 cents per gallon.

The drilling on the job was handled with two Ingersoll-Rand N-72 drills and two jackhammers, all of which were furnished with air by an 800-foot stationary Chicago Pneumatic electric-driven compressor. Blasting was done with 40 per cent Giant dynamite, the holes being first sprung with 60 per cent dynamite.

Personnel

Charles Lybecker was Superintendent in charge of the work for the Derbon Construction Co., while the construction of the canal was under the direction of E. B. Darlington, Superintendent of the Minidoka Project, with J. K. Rohrer and C. H. Spencer, Resident Engineers stationed at Eden and Shoshone, respectively.

Building a Dam With a Power Drag Scraper

ONE interesting phase of a large construction program undertaken by the Chilean Government to develop the agricultural resources of the country is the Recoleta Dam, situated some 5.4 miles inland from Coquimbo, Chile, in the farming and ranching community of Ovalle. This dam is of the earth fill core wall type and when completed will measure about 2,600 feet in length by 150 feet in height from the river bed. It will contain 1,634,000 cubic yards of rolled fill, impound 3,564,000,000 cubic feet of water and will serve to irrigate 72 square miles.

The accompanying illustration shows the method of construction with a part of the impermeable material placed in the river bottom section. This section, 327 feet long by 262 feet in width, required excavation to bedrock which was thoroughly cleaned before impermeable fill was placed. The bulk of the excavation, 55,000 cubic yards was done with a Sauerman 1½-cubic yard steam power drag scraper, the material being dragged to the fore of the dam. Through practically the entire operation the scraper was required to work under water. Before the diversion tunnel was finished, 15,700 cubic yards had been excavated, thus expediting the work considerably.

This project is one of three under contract to Ulen & Co., New York, and will be completed in September, 1932, at a cost of approximately $10,000,000. Kenneth MacIsaac, Construction Superintendent, furnished this information.

A General View of Operations at the Recoleta Dam in Chile, S. A.

When Everyone Works Safely

And All Contractors Recognize the Safe Worker Through Special Awards, Certificates or Buttons

We Shall Have Safe Jobs

By

John Russell, Jr.

Safety Engineer

United Engineers and Constructors, Inc.

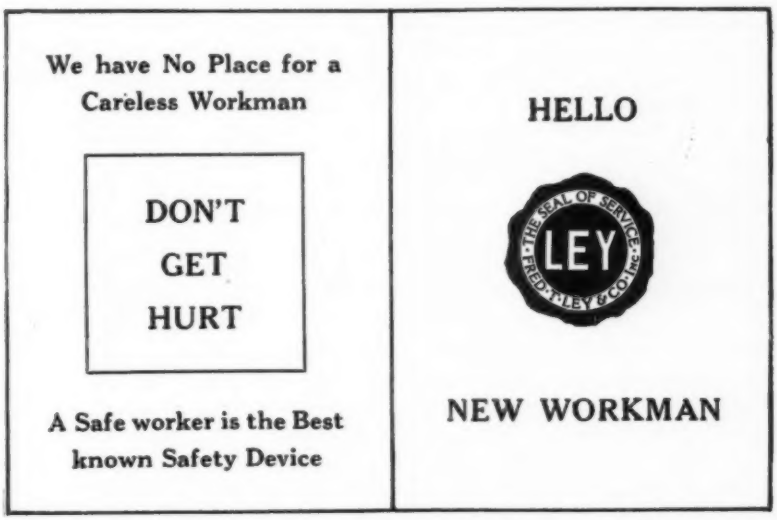
Newark, N. J., Office

WHAT is there that is new in the spreading of the principle of safety by the leaders of the construction industry? Certain companies have found excellent results in keeping constantly before the eyes of the men the company's accident record, detailed as to frequency and severity on the various jobs under way and even subdivisions of the big jobs. Given the facts, the men become earnestly interested in better individual and group records. Give them the facts.

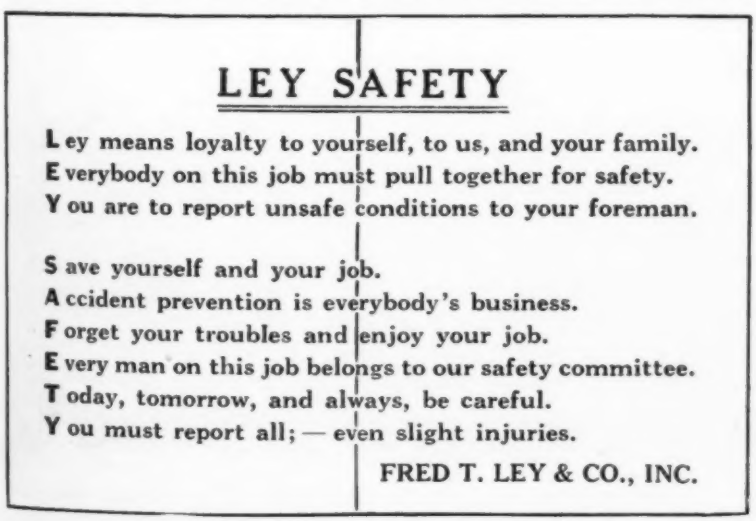
Other companies reward no-accident jobs in some fashion. Still others reward foremen in some way, making the reward of some practical use. United Engineers and Constructors prepared certificates that are awarded to jobs and become the property of the foreman at the end of the month. These show the number of months he operated his job safely. If a foreman goes to another contractor and shows his certificates, it is hoped that his work will be watched carefully and his former employer will be advised if the plan is worth while. It is hoped that by awarding certificates they will serve as a recommendation for the man seeking a new connection, and will also serve the new employer in giving him the information that the foreman knows how to stop leaks in the profits of a job by keeping accidents down to the absolute minimum. Stone & Webster have a plan for awarding lapel buttons to its safe workers.

Until every worth-while contracting company joins hands with similar firms, the safety work of each does not exert its full force, because there is no evidence when a foreman safety-trained by another company is on your payroll. It is believed that certificates or buttons are steps toward this desired goal.

It is also believed that all companies should build for the future. We are reproducing an interesting pamphlet, issued by Fred T. Ley & Co., Inc. That company issues these little



The Two Outside Pages of a Four-Page Booklet Given to New Workmen by Fred T. Ley & Co., Inc.



The Inside Pages of the Ley Booklet

booklets to every new employee. It has elicited remarks from newcomers that they have just completed work for a safe-thinking contractor and were mighty glad they were starting work for another.

This is a definite opportunity to contact with safe constructors, and United Engineers and Constructors have designed striking medallions similar to the one on the face of the Ley folder. The wording inside has been changed a little to fit their needs. They believe that this is a low cost opportunity for contractors who want to join forces and stand in the eyes of construction men as members of a safe-thinking organization. The new man receives one of these folders, let us say, from United Engineers and Constructors. At the expiration of the job, he goes to another company and receives similar evidence from that company. He goes to still another worth-while company and again he receives this tangible evidence of a desire on the part of all of the companies for safety in construction. If he has safety buttons, he is going to show them. If he has certificates, he is going to display them and your safety man is in a better position to lead the men on the job into a mood where they all desire to work safely and have others about them do the same.

IN THE LAST ANALYSIS WHAT IS THE REASON FOR SAFETY WORK?

We have stressed the stopping of money leaks from the profit column through accident prevention work. We have offered the thought that lowered accident costs mean better insurance risks and lower bid costs. We have suggested that with a low accident record the opportunities for lower bids than competing unsafe contractors are legitimately possible.

We all fool ourselves when things are going smoothly into the belief that money is the main consideration for undertaking accident prevention work, but when one of your men is killed and you learn of his home conditions, and you have poured out money to try to ease the pain and suffering, you know in the wee small hours of the morning that your real reasons for encouraging accident prevention work are humanitarian. When you tackle the problem from that angle you will go further than you will ever go from the incentive of cash reward alone and the cost will be no greater.

ACKNOWLEDGMENT: From an aaddress before the Greater New York Safety Conference.

Hoover Dam Tunnels to Require 1,563,000 Cubic Yards of Rock Excavation

THE four diversion tunnels at Hoover Dam that will carry the waters of the Colorado through the canyon walls around the dam site, while the dam itself is being built, are the largest rock tunnels ever to be driven for comparable distances. Work on them will be started immediately by Six Companies, Inc., the contractors, and they will be completed within 18 months.

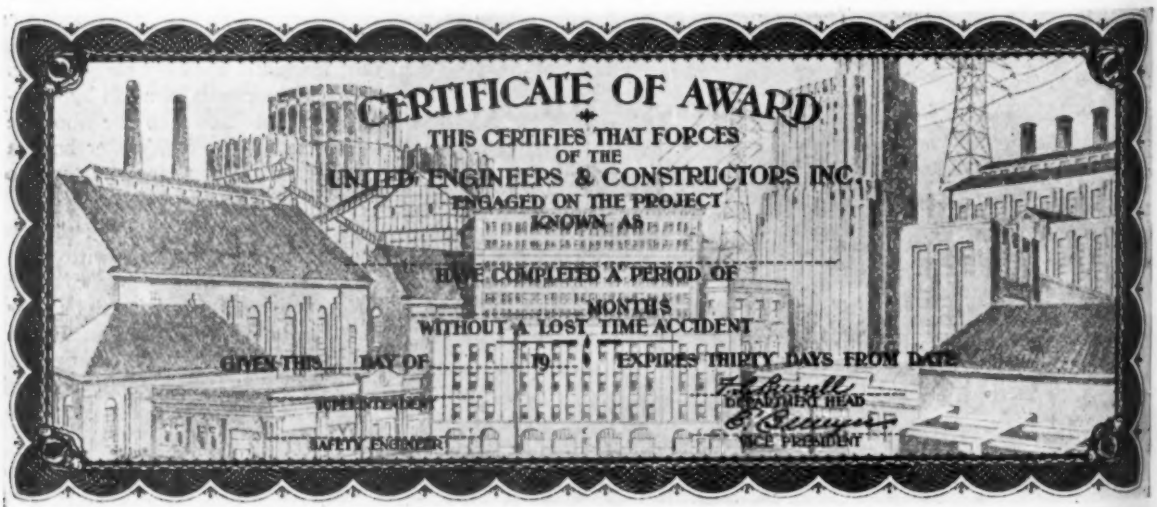
Each of these tunnels will be 57 feet in diameter, about seven times as great in cross section as the Moffat and Cascade Tunnels and each will be 4,000 feet long. Four tubes almost the size of the Holland Vehicular Tunnel between New York and New Jersey could be placed in any one of them.

Other figures on drilling and excavation for this gigantic project are of interest. Approximately 5,800,000 cubic yards of rock will be excavated. Preliminary estimates indicate that about 8,000 miles of drill holes will be required for this work.

Because of the size of the opening, the work will almost come under the heading of quarrying rather than tunneling. There will be sufficient room to muck and transport spoil to the outside without working in cramped quarters. Because there is no space available in the river bottom, all the excavated material from the tunnel will have to be elevated up over the canyon walls for disposal.

Six Companies, Inc., has purchased a stationary air plant consisting of a battery of Ingersoll-Rand Class PRE type direct-connected electric driven compressors having a combined output of 25,000 cubic feet per minute. Smaller I-R compressors of the portable type will operate the rock drills that will be used to scale down the canyon walls on either side of the dam site to guard against rock slides.

Few contractors could possibly expend more than a quarter of a million dollars on new equipment before a contract was actually signed even though the agreement called for a total payment of over $49,000,000. Dirt was moving and the usual construction camp activities started in Boulder Canyon before Secretary of the Interior Ray Lyman Wilbur and W. A. Bechtel, First Vice President of the Six Companies, Inc., signed the formal contract.



A Certificate of Award, the Original of Which Is Printed in Black with a Reddish Background and Green Border, Which Is Awarded for Safe Jobs and Becomes the Property of the Foreman at the End of Each Month

Outline *of* Methods *and* Organization *on a* 7.2-Mile Concrete Road Job *in* West Virginia

A Moment When the MultiFoote 27-E Paver Was Held Up for a Truck

Contractor Combined Effective Machines With Hand Mattock Work on Hard Grade

PROJECT 156B near Walkersville, W. Va., called for the construction of 7.2 miles of 7-inch uniform concrete pavement in two 9-foot strips. The contract was awarded to the Keeley Construction Co., Clarksburg, W. Va., which used an effective combination of hand and machine labor to overcome the unusual conditions of a very hard subgrade. The right of way had been graded a year or two earlier, so that this work began with the fine grading operations.

Fine Grading

A Western road plow and a Lakewood Graderooter were used effectively in breaking up the hard-packed clay subgrade. A Caterpillar Thirty with an Adams No. 8B grader put the finishing touches on the subgrade after it had been broken up. Where there was only a few inches to be taken off, and it was felt that the machines would not be as efficient, the contractor resorted to the use of mattocks and hand labor. Thus the subgrade was not distributed below the final grade. A Galion 10-ton gas roller compacted the grade where it had been loosened and finished with the grader.

Where the redesign of the grade exposed some new rock outcrops the contractor put in a Gardner compressor with jackhammers and used light charges of dynamite to break up the rock. At one point where the excavation was about 5 feet at the top of a hill a Keystone excavator was put in to take out the earth.

A total of forty men were used on the fine grade and form setting. This gang cut the form trench in the

Unloading the Aggregates from Cars to Blaw-Knox Batchers with an Erie Steam Crane

hard grade by hand and set the Blaw-Knox 7-inch steel forms.

HANDLING THE AGGREGATES

The batching plant was located at the south end of the job. Both sand and gravel were received from the New Martinsville Sand & Gravel Co., in bottom dump cars and dumped into pits, from which they were clammed to the Blaw-Knox batcher plant or stockpiles by an Erie crane with a Blaw-Knox ¾-yard clamshell bucket. The crew at the batcher plant included: one craneman, one fireman, one batch man and two men in the cars to clean up. There were two men in the cement car adjacent to the batcher, loading the 7 bags of cement onto the batches in the trucks.

Hauling was done entirely by subcontract with individual truck owners on a batch-mile basis. There was a maximum of twelve trucks. A ticket man at the batcher completed the labor organization at this end of the job.

POURING THE SLAB

"Where the money is made" is what many contractors say when they are speaking of pouring the slab. On the Keeley project three men were used to empty the cement from the bags onto the batches before the trucks were dumped at the skip, one man handled the dumping of the trucks, one man handled the sprinkling of the subgrade and another oiled the forms. The operator of the MultiFoote 27-E paver poured an average of 1,500 feet of the 9-foot slab a day. A home-made subgrade planer was attached to the paver to insure the right thickness of slab. Two men were detailed to shovel from the planer when it cut the grade. Four men worked in the pit and two men spaded and also placed the steel. Three men were used to shovel to the Ord finisher under the direction of the operator.

There were four hand finishers who worked the 10-foot longitudinal float, did the edging and belting, using a belt made of flexible wood, and then finally the burlap was spread by two men, assisted by one man who sprinkled the burlap for the remainder of the day on which the concrete was poured.

On the day following pouring, six men were sent back from the grading or other operations from which they could be spared and they applied the Grasselli silicate of soda for curing the slab.

THE NECESSARY WATER SUPPLY

Water for the paver and for sprinkling the slab for the first 24 hours was supplied from a creek by a Worthington steam reciprocating pump through a 2-inch and 1½-inch pipe line. Taps for the paver hose were placed in the line every 180 feet, and the paver carried 100 feet of hose.

QUANTITIES AND UNIT PRICES

Item	Quantity	Unit Price	Total
Unclassified excavation	28,000 cubic yards	.55	$15,400.00
Dry excavation	200 cubic yards	1.00	200.00
Class A concrete	10 cubic yards	20.00	200.00
Class B concrete	40 cubic yards	14.00	560.00
Reinforcing steel	500 pounds	.10	50.00
18-inch reinforced concrete pipe	100 linear feet	1.90	190.00
24-inch reinforced concrete pipe	20 linear feet	3.50	70.00
Cement concrete pavement	14,860 cubic yards	11.25	167,175.00
Metal reinforcing Type A	205,600 pounds	.045	13,302.00
Premoulded expansion joint	4,150 linear feet	.13	539.50
Project markers	1	25.00	25.00
			$197,711.50

PERSONNEL

The Keeley Construction Co., Clarksburg, W. Va., handled the construction of this pavement with M. W. Dolan as Superintendent. For the State Highway Commission E. W. Chidester was Inspector.

The Second Welding Prize Competition

THE second Lincoln arc welding prize competition is now being conducted by the Lincoln Electric Co., Cleveland, Ohio, and is open to any person or group of persons in any country who submit a paper describing a welding project in which they have been engaged. The purpose of this competition is to increase the knowledge of the adaptability of arc welding to industry.

Papers will be judged by a Jury of Award according to the amount of saving in first cost and upkeep resulting from the application of arc welding to the described redesign or new design, as well as the economic or social importance of the redesign. Further details in regard to the competition, eligibility, requirements, prizes, etc., may be secured from the Lincoln Electric Co., Cleveland, Ohio.

Making a 4-Foot Cut in Rock with a Keystone Excavator After Blasting

Have You Clocked Your Concrete Paving Operations?

Part I

Split Seconds May Split Profits.

A Portion of a Report Prepared by Andrew P. Anderson, Highway Engineer, Division of Management, U. S. Bureau of Public Roads, Based on Data Gathered on 122 Concrete Road Jobs

CAREFUL studies on 122 portland cement concrete paving projects throughout the United States show that an average of 17 per cent of the time during which the construction crew is out on the road ready to work is actually lost because of insufficient supplies and faulty operation of the hauling equipment. The function of the hauling equipment on a concrete paving job is simply to transport the batches from the material yard to the mixer skip at the rate at which they may be utilized by the paver. To perform this function effectively should not be very difficult and yet its inefficient conduct is the reason for many losses in profits and a large number of failures of contractors.

In order to obtain a better insight into this rather general difficulty, and, if possible, to develop some concrete evidence as to how and to what extent these time losses may be reduced or eliminated, an intensive analysis was made of the accumulated field records of the production studies which have been made on actually going projects by the engineers of the Division of Management of the U. S. Bureau of Public Roads. These records contain fairly complete data on more than 100 concrete paving jobs on which trucks formed the hauling equipment and on each of which the studies covered a period of from one to three months. They are of sufficient volume, therefore, to be reasonably representative of present general practice under actual field conditions.

Some of the Causes of Low Production

For practical purposes the main causes which contribute to keeping down production can be grouped under two headings; less-than-capacity load on the controlling or key equipment, and the operation of this equipment at less than its maximum rates. The latter, by far the most common cause of low production, is generally due to various more or less frequent interrup-

In Order to Maintain a Short Mixing Cycle the Truck Body Must Be Hoisted to Dumping Position before the Truck Is Backed to the Skip

tions to steady continuous operation of the key equipment. These interruptions or delays are generally termed time losses. For the sake of clarity, these time losses are divided into two classes: first, those consisting of definite stops, each 15 minutes or more in duration; and, second, those less than 15 minutes in duration. The extent of the time losses of the first class as found on the average job is shown in Table 1.

TABLE 1—PER CENT OF TOTAL AVAILABLE TIME LOST TO THE MIXER IN DEFINITE STOPS, EACH 15 MINUTES OR MORE IN DURATION

Cause of Delay	Per cent of available time lost
Rain and wet subgrade	17.5
Moving plant set-up	3.5
Lack of materials	3.5
Lack of prepared subgrade	3.0
Inadequate supply and faulty operation of hauling equipment	3.0
Mixer trouble	2.0
Lack of water at mixer	2.0
Loading plant trouble	1.5
Miscellaneous causes	4.0
	40.0

After the contractor has obtained his contract, set up his plant and assembled his crew, we can thus predict that the average job will lose for various causes about 40 per cent of the available working hours in definite stops varying from 15 minutes to days in duration. Nearly one-half of these time losses are each less than one-half day in duration and thus directly affect both mixer and hauling equipment operation. But this is not the end of the trouble. The records also show conclusively that every job loses a considerable amount of time in minor delays or interruptions each less than 15 minutes in duration. Furthermore, all these short-time losses occur with the full crew on the job and are thus proportionately much more costly than full day losses when most of the crew is not paid. The average of these minor time losses based on an analysis of 122 jobs is shown in Table 2:

TABLE 2—AVERAGE TIME LOST TO THE MIXER THROUGH DELAYS LESS THAN 15 MINUTES IN DURATION

Cause of Delay	Per cent of net working time lost	Per cent of total working time lost
Hauling equipment, supply	2.3	1.4
Hauling equipment, operation	7.9	4.7
Hauling equipment, dumping	2.0	1.2
Lack of trouble with water at mixer	3.2	1.9
Subgrade delays	2.7	1.6
Mixer operator	2.1	1.3
Mixer trouble	1.9	1.1
Lack of materials and supplies in place	1.1	0.7
Finishing	0.7	0.4
Miscellaneous	2.1	1.3
Total	26.0	15.6

Many of these second-class delays or minor time losses, and frequently most of them, are of very short duration, but are actually repeated every cycle so that their total often becomes astonishingly large. Furthermore, all these losses occur with the full crew on the job and are thus proportionately much more costly than full-day losses when the crew is not paid.

Table 2 shows that the average job loses 26 per cent of the net working time or 15.6 per cent of the total available time in delays and interruptions, none of which are as long as 15 minutes and most of which are each of only a few minutes or seconds duration, but of a constantly recurring nature.

In these minor time losses 12.2 per cent of the net working time or 7.3 per cent of the total working time is due to the hauling equipment. These losses are divided on a percentage basis as follows: 19 per cent or about one-fifth arise from actual shortage of hauling equipment; 17 per cent or about one-sixth from dumping the batches and the remaining 64 per cent or nearly two-thirds from faulty or inefficient operation of the hauling equipment on hand. It is noted in Table 1 that 3 per cent of the total available time was lost, due to the hauling equipment, in stops of more than 15 minutes duration. These naturally all occurred while the full crew was on the job and might better be included under the net working time losses. On this basis the time losses charged to the hauling equipment amount to approximately 17 per cent of the net working time, or 10 per cent of the total available time.

All Operations Must Be Synchronized on Concrete Paving Jobs

In order to understand better why it is that the hauling equipment is the cause of such large and persistent delays to the continuous operation of the mixer, it is necessary first to analyze the method of conducting a modern concrete paving job and just what factors or conditions influence or control its rate of production. The process of constructing a concrete pavement is essentially a continuing operation, in which the maximum rate of production is fixed by the requirements which determine the length of the mixer cycle.

Every interruption to steady continuous operation of the paver on this cycle results in a decrease below the otherwise possible rate of production. There is, therefore, practically no opportunity for any appreciable variation in the rate of any of the numerous dependent operations, nor is there any chance to anticipate the requirements of these different operations except at the loading point where there is usually some opportunity to provide sufficient storage of materials to eliminate the delays which might otherwise occur, due to switching or the non-arrival of cars.

From this point on, all operations are clearly interdependent. The materials must be proportioned, loaded and hauled to the paver at a rate determined by the duration of the mixer cycle. The operations of finishing and curing cannot be allowed to fall behind, nor those of preparing the subgrade, setting the forms, placing steel and forming joints be allowed to lag, but all must proceed at least at the general rate set by the mixer.

A Batch Lost Is a Batch Lost Beyond Recall

Losses of time occasioned by lack of coordination between the various operations involved are irretrievable. Not even the loss of a single batch from the given maxi-

mum rate during one hour can be made up by more rapid operation during the next hour or the next day without violation of specifications. If, for example, the mixer cycle is 75 seconds, the maximum possible rate is 48 batches per hour, and a production of, say, 45 batches during one hour cannot be made good by a production of 51 batches during the next hour.

Such decreases in production would not be a very serious matter were it not for the fact that, exclusive of materials and hauling, the daily or hour cost of operating a concrete paving plant is practically constant, whether production is at the maximum possible rate or at almost any fraction thereof, so long as it is operating at all. Records which have been examined show rather conclusively that the average hourly cost of operating a modern concrete paving plant, exclusive of materials and hauling is seldom less than $40 or $45 for every hour the paving crew is out on the road. If, for example, the mixing time and operating requirements permit a mixer cycle of 75 seconds and the hourly operating cost is $40.80, the operating cost per batch will be only 85 cents when the outfit is working at 100 per cent efficiency, and this cost will rise to $1.70 per batch when production falls to 24 batches per hour. This example emphasizes the importance of keeping the mixer in continuous operation on the lowest possible cycle.

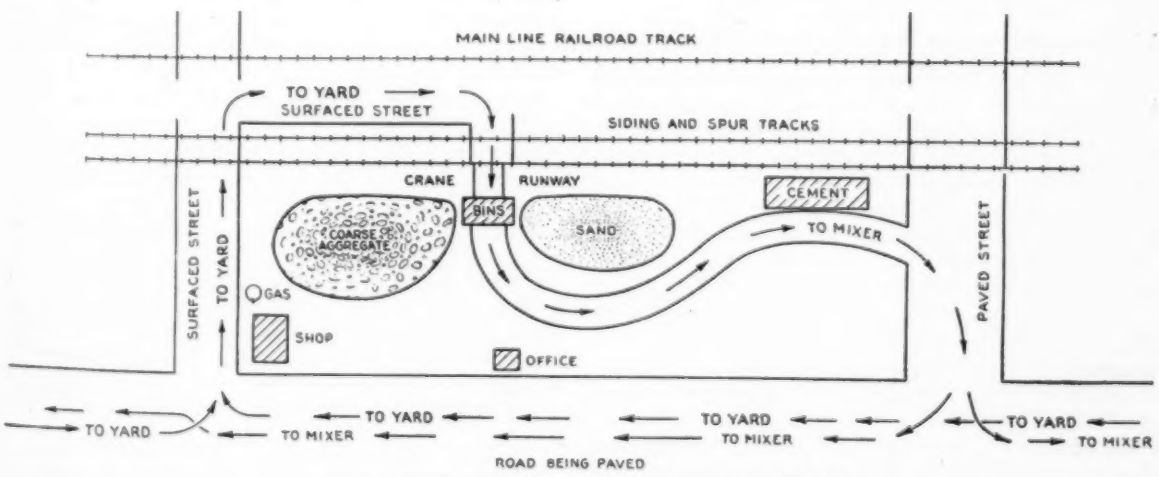
Under the usual field conditions neither the mixer nor the hauling equipment can be operated for any extended period of time at 100 per cent efficiency. Theoretically, the mixer can be operated continuously on some definite cycle, determined in part by its mechanical condition and the skill of the operator, but mainly by the specifications and working methods required. In practice, neither truck nor mixer operation ever continues for any length of time at this maximum possible rate and still more seldom do both obtain this rate simultaneously. A large number of causes seem to conspire to prevent perfectly coordinated operation. As the rate of maximum production is approached, the difficulties of maintaining this all-essential degree of coordination multiplies at an amazing rate. This does not mean that highly efficient operation is impossible, for the records show many cases where for a week at a time operation reached or closely approached 95 per cent of the theoretical possible maximum production.

An Analysis of Hauling Operations

In order to present a better understanding of the reasons for the large, persistent and expensive losses which are due to the hauling equipment, a somewhat detailed analysis will be made of the operating conditions of the hauling equipment and the functions with which it is associated or on which it is dependent. On the average well-managed concrete paving job, the hauling equipment cycle is about as follows: the truck, on entering the material yard proceeds to the batcher to receive the sand and coarse aggregate. Usually some maneuvering is necessary in order to get the truck into position under the batcher. Especially is this true where more than one size of coarse aggregate is required and two bins are used. If the truck carries more than one batch it requires some movement before taking on each additional batch. The truck then proceeds to the cement platform where a stop is made to take on the bags of cement. If bulk cement is used a canvas cover is usually spread and fastened down after the cement has been dumped on the batches, or a special container is provided. The truck then proceeds to the mixer.

The turntable is usually placed 200 to 300 feet ahead of the mixer. The truck drives on the turntable, is turned 180 degrees, backs off and proceeds in reverse toward the mixer. If sack cement is used, it is a common practice for the men who empty the bags to board the truck at the turntable and empty the bags on top of the batch while the truck is being turned and backed to the mixer. On some jobs a definite stop is made at some other point well ahead of the mixer, where the cement bags are all emptied before the truck proceeds to the turntable.

If no turntable is used, the turn is usually made somewhat further ahead of the mixer at a place where one or two forms are temporarily omitted so as to provide more room for maneuvering. If the previous truck has been unloaded, the oncoming truck proceeds to the



Plan of a Good Yard Layout for Concrete Paving Work

mixer, hoists the body to the dumping position and, as soon as the skip is down, backs into position on the skip. The dump man then drops the first batch and the truck is driven ahead sufficiently to clear the skip. After the latter has been emptied and returned to the ground, the truck is again backed up and another batch is dropped. When the last batch has been dropped, the truck is immediately driven ahead, the body is lowered and the truck proceeds to the material yard. On arrival at the yard, the end gates are closed and the truck is ready to begin the cycle of the next load.

TRUCK OPERATING TIME IS MADE UP OF A TIME-CONSTANT AND HAUL

Truck operation may be divided into parts. The first part includes the time spent while the truck is being loaded at the material yard, plus the time required for turning, backing and dumping at the mixer, plus such waste or delays as are necessary or incidental to both these operations. The total time required for these operations is designated as the time-constant. The second part is the time spent in travel between the material yard and the mixer and is designated as the haul. The items going to make up the time-constant will be considered first.

An analysis of the various steps comprising the truck operating cycle shows considerable variation, but an examination of many truck haul jobs shows the average values as given in Table 3 for the items which go to make up the truck time-constant or the time which the truck spends each trip in operations other than actual driving on the road between the material yard and the mixer.

TABLE 3—AVERAGE TRUCK TIME CONSTANT ON ALL CONCRETE PAVING JOBS

Operation or Item	Time Consumed in Seconds 1-batch truck	2-batch truck	3-batch truck	4-batch truck
Batcher plant:				
Loading sand and stone or gravel	15	59	114	190
Loading cement	28	80	106	110
Driving and maneuvering within yard	81	99	102	100
Mixer:				
Turning at mixer	68	75	64	93
Backing to mixer	56	77	70	75
Dumping batches	23	128	200	303
Waits or delays	141	178	292	417
Total time-constant per round trip	412	696	948	1,288
Total time-constant exclusive of waits	271	518	656	871

WELL-ORGANIZED JOBS SHOW LOWER TIME-CONSTANTS

While Table 3 shows average values for a large number of jobs and thus reflects the operating rates which might reasonably be expected on the ordinary job, they do not show what time is actually necessary to perform these various operations from day to day as indicated under actual field conditions. A smaller number of exceptionally well-managed jobs was therefore selected to afford a nearer approach to the theoretical values of these same items. These are given in Table 4.

It may be noted first that on the average job, as shown in Table 3, the total time-constant is 30 to 50 per cent larger than the net time-constant, or, in other words, that on the average concrete paving job, about one-third to one-fourth of the actually observed gross time-constant is due to waits and delays. Table 2 and the discussion following it show that on these jobs, so far as net working time is concerned, the mixer was operating at an average of about 26 per cent below its full capacity and to this loss of production, the hauling equipment contributed about 12 per cent. If all hauling delays of more than 15 minutes duration are included, the figure becomes 17 per cent or more than half the loss of net working time. This is in sharp contrast to the average time-constant on the well-managed job. On these the total time-constant is on an average nearly one-third lower than on the average job and only about one-fourth of the total time-constant is due to waits and delays, as compared with about one-third on the average job. Perhaps the most striking difference is the fact that on these well-managed jobs, the mixer was operated at an average of only 13 per cent below full production. To this loss the hauling equipment contributed only about 4 per cent, or one-fourth as much as on the average job. The records show one job on which during two full months only 1.96 per cent of the mixer time loss was due in any way to the hauling equipment.

TABLE 4—AVERAGE TRUCK TIME-CONSTANT ON WELL-MANAGED CONCRETE PAVING JOBS

Operation or Item	Time Consumed in Seconds 1-batch truck	2-batch truck	3-batch truck	4-batch truck
Batcher plant:				
Loading sand and stone or gravel	12	48	90	150
Loading cement	24	47	73	102
Driving and maneuvering in material yard	42	54	60	65
Mixer:				
Turning at mixer	28	39	54	60
Backing at mixer	54	60	75	75
Dumping batches	19	110	157	265
Waits and delays	74	120	161	226
Total time-constant per round trip	253	478	670	943
Total time-constant exclusive of waits	179	358	509	717

DELAYS IN HAULING AND DELAYS IN MIXER OPERATION ARE NOT CONCURRENT

Another difficulty which the paving contractor faces is that the operation of the hauling equipment is no more perfect than the operation of the mixer and sometimes far less. Poor operation of the hauling equipment is quite as likely to occur when the mixer is functioning at its best and therefore requires perfect operation of the hauling equipment in order to avoid delays, as it is when the mixer is functioning poorly and does not require so many batches per hour. The net effect of these non-concurring operating rates results in a bunching of trucks at the mixer when the trucks are operating well and the mixer poorly and a lack of batches when the conditions are reversed.

Since 100 per cent operating efficiency is not long maintained by either mixer or hauling equipment, it becomes necessary to have a certain apparent oversupply of hauling equipment in order to prevent too many mixer delays due to waiting for batches during those periods when the mixer is going well and the trucks poorly. The data seem to indicate that the general practice is to have such a number of trucks that an average of from one to two batches will ordinarily be waiting at the mixer. In practice, this means there are times when a dozen or perhaps even more batches will be waiting ahead of the mixer, while at other times, the trucks will not be quite able to supply its demands.

YARD LAYOUT AND OPERATION

One of the very common causes contributing to a

large time-constant is a poor material yard layout. Usually there is no choice as to location, but, too frequently the best use is not made of the conditions available. The general practice is to set up the batcher so that the trucks must turn and back under in order to receive their loads. In fact, many bins are so built that a drive straight through is impossible. This is unfortunate, because turning, backing and maneuvering a truck requires time which might otherwise be utilized in hauling batches. In fact, the yard layout and the routing of the several necessary operations should be planned as carefully as the performance of the several operations of the mixer.

The ideal yard layout would be one in which the trucks could enter at one end on a wide curve, drive through under a loading bin having compartments for all the aggregates pass on to a nearby cement loading platform and storage shed and then proceed on a tangent or easy curve to the main road. The accompanying figure shows a yard layout which closely approaches this ideal. The effect of the yard layout on the time-constant is also shown in Tables 3, 4 and 9. In any yard layout, the unproductive truck time should be reduced to a minimum as every deviation from this attainment results in an inescapable penalty in the form of more expensive hauling.

Modern bins and batchers can be operated so rapidly and with such regularity that there is usually no valid excuse for requiring the trucks to spend a long time at the loading plant. Modern batchers will ordinarily handle a 30-cubic foot batch of sand and one size of stone in 5 to 35 seconds, depending largely on how dry the sand is. If two sizes of coarse aggregate are used with a three-way bin, the cycle will ordinarily be increased from 5 to 12 seconds. For one-batch trucks, the actual loading time is practically reduced to the time taken to dump the hoppers as the filling and weighing can usually be accomplished while the loaded truck is passing out and the empty one is moving into position. Tables 5 and 6 give several values as found from time studies of batcher operations on representative jobs.

With the Cement Sacks Stacked on Hand Trucks There Is Little Delay in Loading the Batch Trucks

A Set-up with a Clear Space for the Trucks to Drive Through. On This Job the Bins and Batches Were Mounted on a Gantry and Moved on Rails Along the Line of Sand and Stone Cars

TABLE 5—TIME OF BATCHER OPERATION ON REPRESENTATIVE JOBS

Type of Batching	Operation	Time in Seconds
1-compartment batcher	Weighing sand	7.6
	Setting scales	4.1
	Weighing stone	5.7
	Dumping and returning	5.6
	Total cycle	23.0
Sand and one size coarse aggregate; 2-compartment batcher	Weighing sand	7.3
	Weighing stone	8.9
	Dumping batch	7.1
	Total cycle	23.3
Sand and two sizes coarse aggregate; 2-compartment batcher	Weighing sand	7.8
	Weighing No. 1 stone	10.0
	Weighing No. 2 stone	7.0
	Dumping batch	5.0
	Total cycle	29.8

TABLE 6—BATCHER OPERATION IN LOADING THREE-BATCH TRUCKS FROM A ONE-COMPARTMENT WEIGHING BATCHER

	First Batch	Second Batch	Third Batch
Discharging batch loaded while truck drives in	5.2	....	....
Setting scales	....	3.0	3.1
Weighing sand	....	10.9	11.6
Setting scales	....	2.4	2.9
Weighing gravel	....	4.2	4.1
Discharging batches	....	5.6	5.5
Delays and waits, seconds	....	....7.8	...
Total time to load 3-batch trucks, seconds	....	.. 66.3	...

Unfortunately, the yard layout and operation procedure is seldom such as to permit full advantage to be taken of the rate at which the batchers can be operated. Frequently, the yard layout is such that actually more time is consumed in maneuvering and driving within the yard than in the actual operation of loading. Table 7 gives the average record of a large number of time studies on yard operation in one yard. Two-batch trucks were used with a 2-bin set-up in a supposed effort to facilitate the use of two sizes of coarse aggregate. A toll of nearly two minutes was exacted from every load which was passed through this yard.

TABLE 7—EFFECT OF POOR YARD LAYOUT ON TIME REQUIRED TO LOAD 2-BATCH TRUCKS

Operation	Time in Seconds
Closing end gates of truck	27.5
Driving to gravel bin and backing under	34.5
Loading gravel, 2 sizes, 2 batches	67.0
Driving to sand bin and backing under	44.0
Loading sand, 2 batches	30.0
Driving to cement car	39.5
Loading cement bags	57.5
Waits and delays	9.5
Total time required for taking on load	309.5

EFFECTIVE HANDLING OF CEMENT IN BAGS OR BULK ELIMINATES DELAYS

Handling cement bags sometimes consumes much more time than should be necessary. Twenty-five seconds per batch of 7 bags is readily attained on many jobs, though some few of those studied consumed more than twice this time, usually because of an improper loading platform. For speedy loading the platform should be somewhat higher than the top of the truck body. A little time will also be gained if the bags in the car are stacked to the same height as the number of bags required per batch.

On some jobs, especially in the more arid regions, a practice is made of hauling the bags to the road on separate trucks and distributing them along the subgrade where they are later picked up by two or three men and emptied in the mixer skip. The records show that when the bags are properly and conveniently placed, good laborers can empty them in the skip at the rate of 9 to 10 man-seconds per bag. About the same rate can be obtained in dumping the cement bags on the trucks after they arrive at the mixer. Two men are usually employed for this work. The use of bulk cement is rapidly coming into vogue in some sections. Typical time studies of handling bulk cement in 2-wheel buggies show the average values given in Table 8. The time which the trucks are necessarily delayed at the cement platform need only be a few seconds more than the time required to dump the buggies on the trucks or about 15 seconds per batch. At least one more buggy than the number of batches handled by each truck should be provided where bulk cement is used.

TABLE 8—TIME OF HANDLING BULK CEMENT WITH THREE-MEN LOADING BUGGIES

Operation	Time in Seconds
Loading buggy	67.0
Wheeling buggy to scales	13.0
Weighing and adjusting contents	16.4
Wheeling buggy to truck	7.2
Dumping buggy on truck	12.4
Returning buggy for loading	13.0
Total time per buggy	129.0

A few time studies have also been made on the operation of mechanical plants for handling bulk cement. The average values obtained from these studied are given in Table 9.

TABLE 9—TIME OF OPERATION OF A BULK CEMENT BATCH

Operation	Time in Seconds
Loading and weighing	26.9
Dumping cement on truck	23.8
Total cycle	50.7

The present practice in handling bulk cement usually requires that the cement be dumped on the top of the sand and gravel and a canvas cover be spread over the load, or else that it be carried in a special container. Spreading and fastening down the canvas covering usually consumes from 20 to 30 additional seconds.

OPERATION OF THE TRUCKS AT THE MIXER

When the truck reaches the vicinity of the mixer, the first operation is either to turn it by maneuvering through a space where two forms have been removed or, more frequently, on a turntable. The value of the turntable lies chiefly in the fact that for some types of trucks, the time of turning is considerably decreased and, if the ground is soft, the subgrade is not cut up so badly. Table 10 shows typical time studies for good operation of a light turntable when turning one-batch trucks. For heavier trucks, a larger turntable is required and the time elements are somewhat increased, but even a three-batch truck can readily be turned in 60 seconds.

TABLE 10—TIME ANALYSIS OF TURNTABLE OPERATION WITH ONE-BATCH TRUCKS

Operation	Time in Seconds
Running truck on turntable	4.4
Rotating turntable 180 degrees	12.1
Backing truck off turntable	7.7
Total time to turn truck	24.2
Time required to return turntable for use of next truck	10.6
Total operating cycle	34.8

A rather common custom where the cement is carried in bags on the batch truck is to have the dumpers climb aboard as the truck reaches the turntable or the turning place. Two men can readily dump the bags while the truck is turning and backing to the mixer, especially if the tie wires are cut at the loading plant.

More frequently a small platform or light truck is placed some distance ahead of the mixer where each batch truck stops long enough for the men to step aboard, dump the bags and step off. The time required is about 5 seconds per bag when two men work on the platform or 10 men-seconds per bag. While this method makes it easier to take care of the empty bags, as they can all be saved, bundled and tied up by the men who do the dumping, a definite amount is added to the time-constant of the truck operation. For two-batch trucks, carrying 14 bags of cement, this is seldom less than 75 seconds. The saving in bags and the added safety of the workers must then be balanced against this extra cost of truck time. Probably there are many jobs on which adoption of this method would prove profitable.

The operation of dumping the batch into the waiting skip usually presents no particular time-consuming delays except where one-batch trucks with gravity dump bodies are used. Some types of gravity dump body are very difficult to dump, unless the load is placed exactly right and especially so when the mixer is working down a steep grade. Needless to say, this type of dump body should never be permitted on the job. The actual dumping of properly equipped one-batch trucks as well as of each batch of the larger trucks is often accomplished in 10 seconds and in no case should the

truck detain the skip for more than 30 seconds. An average time of 20 seconds for dumping each individual batch is found on many jobs. The total time which the truck is necessarily detained in unloading, however, varies with the number of batches carried and the operating cycle of the mixer. If the skip is down the one-batch truck can drop its batch and immediately proceed on its way for another load. The truck carrying two batches drops the first batch in the skip and immediately, without lowering the body moves forward sufficiently to clear the skip, waits while the skip is raised and again returns to the ground, and then quickly backs up and drops the second batch. The total dumping time is, therefore, at least one full skip cycle, usually about 35 seconds, plus the time required to drop the two batches.

Ordinarily the mixer operator will not be ready to raise the skip as soon as the truck clears it after dumping the first batch. For two-batch trucks, therefore, the total dumping time generally approximates one and one-half cycles on a well-managed job on which the practice is to have the truck bodies hoisted into dumping position before backing into the skip and to employ a dump man to drop the batches. The total dumping time of 3 and 4-batch trucks, however, must include at least one or two full mixing cycles, respectively, plus one skip cycle and the time required to drop the first and the last batch. As in the case of the two-batch trucks, the time actually consumed in dropping the first and last batch will approximate one and a half cycles, so that the time the truck is actually detained even on perfect mixer and truck operations will closely approximate two and one-half and three and one-half mixer cycles for the three and four-batch trucks, respectively. On the average job, the total time the truck is detained at the mixer will be somewhat greater than this because of the delays to continuous mixer operation which occur from time to time, and the more batches carried, the more frequently will these delays occur while the truck still has batches to unload, rather than when trucks are being exchanged. This fact probably explains why the actual dumping time of the three and four-batch trucks as shown in Tables 3 and 4 is somewhat longer than would normally be expected when compared with the dumping time of the two-batch trucks.

Variations in Hauling Speeds

Practically all the stop-watch studies of truck operation show the time spent by each truck during each trip in driving from the loading yard to the turning point at the mixer, the time spent in returning from the mixer to the loading plant and the exact mileage between these points. The condition of the road and the mechanical condition of the trucks were also noted. The road speed of both loaded and empty trucks is therefore readily obtained as well as the average round trip speed. The latter quantity should be computed by dividing twice the hauling distance by the total time, loaded and return. The average of the two speeds will not give the correct results unless they are very nearly equal.

The variations in hauling speeds both loaded and unloaded are very large. The studies made include jobs on which the average round trip speed was 10 miles an hour and for individual one-hour studies was as low as 6 miles an hour, as compared with jobs on which the average round-trip speed exceeded 30 miles an hour and even exceeded 40 miles an hour during one-hour studies. The speed was found to vary with many factors, the chief of which were grades, mechanical condition of the trucks, the type of trucks, the amount of traffic interference, whether or not all the trucks were capable of maintaining the same speed, the length of haul and particularly the condition of the road surface. The average length of haul from loading yard to mixer on 122 jobs was found to be 2.65 miles. Complete hauling studies are not available for all of these jobs, but the average round trip speed on all those containing complete data was 18 miles an hour with maximum speeds on individual one-hour studies running from as high as 45 miles per hour to as low as 6.

A Platform at Truck Body Height Saves Time All Day for the Men Cutting and Emptying Cement Bags

Table 11 made up from the studies on four separate jobs illustrates the great variations in average truck speeds which are found in the field of the different jobs and something of how the average round-trip speed on almost any job varies with the length of haul.

TABLE 11—EFFECT OF LENGTH OF HAUL ON AVERAGE ROUND-TRIP SPEED ON FOUR TYPICAL JOBS

Job No.	Hauling Conditions	Length of Haul Miles	Average Round-trip Speed Miles per Hour
1	Good pavement, 3-batch trucks, excellent condition	1.58	27.1
		1.81	27.5
		2.04	28.3
		4.35	33.7
		4.97	37.2
		6.24	40.2
2	Earth and gravel road, fair to poor, 2-batch trucks, fair condition	0.18	6.0
		0.46	10.9
		1.17	16.5
		1.73	17.4
3	Earth road, fair condition, 1-batch trucks, fair condition	0.52	9.8
		0.80	11.4
		1.02	13.1
		1.48	15.8
		1.87	16.5
		2.45	17.4
4	Earth, gravel and pavement, fair to poor; 3-batch trucks, fair condition	0.66	7.2
		0.95	8.1
		1.20	8.2
		1.78	8.7
		2.08	10.8
		2.30	10.4

(*Continued in June issue*)

How the Other Fellow Did It

Calcium Chloride Solution Applied Automatically With Mixing Water

89. A Connecticut contractor devised a simple and automatic device for the application of the 2 per cent solution of calcium chloride required by the State specifications, the solution being charged by gravity as the paving skip was raised. Mounted on the platform of the 27-E paver were two 55-gallon drums connected with each other by a 2-inch pipe through short nipples and control cocks. From the front end of the pipe a 2-inch rubber hose ran to a small tank mounted on the paver skip about 2½ feet from the end. The tank which had a capacity of 10 quarts was made by cutting an 8-inch pipe to the proper length with an oxy-acetylene flame and welding caps on either end. At the end farther from the solution tank, a nipple and two angles formed a connection for a rubber hose. At the top of this connection, there was a small overflow pipe of ¼-inch pipe with the end brought down to a 1/16-inch opening. This acted

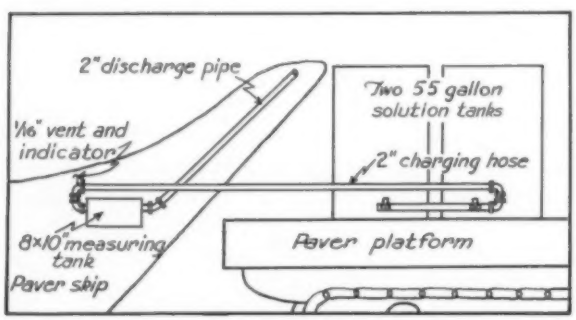


Diagram Showing the Layout of the Calcium Chloride Equipment

as a vent for air and showed when the small tank was filled without wasting a quantity of the solution. From the other end of the tank a 2-inch pipe ran along the outside of the skip to a point where it discharged directly into the mixer drum. The slope of the pipe was calibrated so that the solution standing in the system including the small tank and pipe was exacting 12 quarts, the amount of 2 per cent solution required.

The operation of the solution dosing machine was as follows: the calcium chloride operator emptied two 100-pound bags of calcium chloride into each of the 55-gallon drums and then filled each drum up to a mark on the inside of the drum which gave the correct amount of water for the solution. During this operation the cocks controlling both of the drums were closed. As soon as the solutions were ready and the paver was about to begin operation, the valves from the drums were opened and the solution flowed by gravity into the rubber hose, filling the small tank and pipe along the paver skip to the proper level controlled by the small overflow pipe on top of the tank. When the system was full, the solution began to flow out in drops. No valves were used other than when charging a solution drum and no pumps were needed to give an accurate amount of calcium chloride each time the skip was raised to charge the mixer drum.

When the paver skip was raised the solution ran out of the pipe and tank into the drum of the paver by gravity. Air entered the small overflow pipe, thus permitting rapid flow. Lowering the skip started the next cycle. 20.2.57

Cement in Paper Bags Placed at Bottom of Batch

90. On a job visited not long ago, the contractor handled the cement in a novel manner. It is customary on most paving jobs to carry the bags of cement on top of the batched sand and stone or to line them up along the forms. On this job the cement in multi-wall paper bags was loaded into the truck first at a platform alongside, just below the freight cars in which the cement was received. Then the truck backed under the batcher and received first its sand and then stone, completely covering the bags. When the batches were dumped into the paver skip, the bags came out on top and were quickly broken up with picks, emptied and bags thrown aside to be disposed of by burning when a sufficient number accumulated. This procedure seemed very effective, but would not be possible with cloth bags because the bags might take up sufficient moisture from the sand during a long haul to cause "balling" of the cement in the mixer. 20.6.61

Sequence of Paving on 4-Strip Roadway

91. Condition of the subgrade, traffic and other factors frequently seriously hamper the contractor in the choice of sequence of paving the various strips in a multi-strip concrete paving job. A Connecticut contractor gave considerable thought to sequence when handling a job which ran for nearly 9,000 feet uphill. Paving was started at the foot of the hill beginning with the left-hand 10-foot strip. By adopting this method, the paver ran uphill in the adjacent strip and the trucks were always on the unfinished grade until the fourth strip was paved and then they ran on completed pavement. There was an additional advantage in this method, as the welded reinforcing mat could be laid in the strip ahead of the paver and not simply piled alongside the strip and rushed in at the last second before the strip was poured. 20.2.59

Placing Fill Over Muck

92. A contractor in handling the placing of a fill on a muck bed nearly 1,100 feet long and with an average depth of 14 feet in northern Indiana, found from experience that the bed could not be excavated satisfactorily as had been done on a 1,300-foot muck bed in another part of the same job. Consequently, dynamiting was resorted to. The preliminary dynamiting consisted of placing one pound of 50 per cent dynamite every 4 feet along the center line and every 4 feet in lines 8 feet each side of the center line. The holes were made to such a depth that the charge of dynamite was at least 4 feet below the surface of the muck and no less than 40 feet along the center line was shot simultaneously. The work was carried out by three men and an electric detonator.

Immediately following the preliminary dynamiting the fill was started with a base width of 25 feet and built to grade in 1-foot layers and each layer rolled with a 10-ton roller. Then, without further compacting the fill was raised to approximately 6 feet above grade. During the next three weeks the fill was left to be accurately observed in order to determine its penetration, amount of settlement and whether further dynamiting would be necessary. The penetration proved to be sufficient to carry the 6-foot overburden without any settlement whatsoever over the entire length of the fill. A one-yard shovel was then used to remove the 6-foot overburden and the material was used to widen the fill. 20.1.110

100,000 Cubic Yards Moved *in* 64 Working Days

By
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EXCEPT for the material lying in front of the sheet piling, 100,000 cubic yards of spoil was shoveled and hauled away in 64 working days from the site for the new laboratory building of the Mellon Institute of Industrial Research in Pittsburgh. Work was started on November 5, 1930, and was almost finished at the end of January, 1931.

The Project

In May, 1930, it was announced that as the present main building of Mellon Institute on the University of Pittsburgh campus, and an annex several blocks distant, were overcrowded, a modern new building would be erected, work to be commenced late in the year. The site is in what is known as the Institutional or Civic Center, 3 miles from down-town, and in a large group of educational and research buildings.

The new laboratory structure will be of that type of classical Greek architecture known as Ionic. It is to be seven stories high, three below and four above the street level, with monolithic columns along all four sides. The proportions will be approximately 300 x 400 feet. The main entrance, which is to be on the third floor, will be reached by steps extending along the entire front of the building. The laboratories are to face interior courts. The design of the new building is to be such that additional laboratory suites can be constructed in the interior courts without marring the beauty of the general appearance and without interfering in any way with the original laboratory units.

Class of Ground Excavated

By the end of June, 1930, the site had been core-drilled and charted by the Pennsylvania Drilling Co., Pittsburgh. Fifteen holes were drilled. Of these, twelve were bottomed at 35½ to 45 feet, two at 75 feet, and one at 100 feet. Seven of the holes showed the following formation:

LOGS OF DRILL-HOLES

	Hole						
	1	3	4	6	7	9	14
Clay, hard, dry, and tough	10	10	8	16	14	9	15
Sand, dry	4	4	15	4	6	16	15½
Clay, sticky	4	4	..	4	3	..	..
Sand, wet	8½	10	..	5	6	..	..
Sandstone	..	..	..	..	..	..	1
Shale, soft blue	..	..	2	..	5	2¾	3¾
Sandstone	10½	10¼	10	12¼	6½	9	8½
Shale, various	3	1	½	58¾	1½	..	½
Total feet	40	40	35½	100	42	36¾	44¼

As in hole 6, holes 2 and 11, which were continued to 75 feet, showed red, blue and variegated shale. On this shale, which is practically level throughout, the concrete

Excavating the Site for the New Research Laboratory of the Mellon Institute, Pittsburgh

foundations will be laid; only a foot or so of the top layer of shale was removed by the shovels and light blasting. An analysis of this material by the Pittsburgh Testing Laboratory gave 76.16 per cent silica, 11.68 per cent alumina, 3.72 per cent iron oxide, 1.00 per cent titanium oxide, 0.30 per cent calcium oxide, 1.19 per cent magnesium oxide, 2.34 per cent alkalies, 0.15 per cent sulphuric anhydride, and 3.40 per cent loss on ignition. The silica content is identical with that in the clay to be discussed.

THE SAND AND CLAY

Probably the most interesting features of the ground were the strata or layers of sand, clay, and sand. The sand, of brown, yellow and gray colors, was generally dry to moist in the upper layer, and contained about 15 per cent moisture in the lower layer. The clay was of a bluish gray color, sticky, and tough to dig. Except at two places these three layers were sharply defined. There was no sand in the clay and no clay in the sand. A grab sample of the lower sand was dried and screened, and gave 98 per cent through 20 mesh, 42 per cent through 60 mesh, and 4 per cent through 100 mesh. The colors were due to iron, and when the latter was removed with acid, the microscope showed the sand grains to be angular to round and remarkably even in size, and mostly of quartz; the silica content by analysis was 97 per cent. The clay is really not a true clay which may contain 50 to 65 per cent silica and 15 to 20 per cent alumina, but is largely composed of extremely fine sand and silicated, 76 per cent silica by analysis, which becomes very hard on air drying, and filters and settles rapidly when mixed with water. It is as plastic as any clay. The sand and clay were alkaline to neutral in reaction, and were devoid of odor; therefore, no decomposition had been going on and there was no organic matter in these alluvial deposits.

EQUIPMENT AND PERFORMANCE

Three crawler shovels were employed, as follows: one Erie steam shovel with ½-yard dipper; one Erie gasoline shovel with 1-yard dipper, consuming about 50 gallons per day; and one Thew-Lorain 75-A gasoline shovel with 1¼-yard dipper, using about 80 gallons per day. These machines were easily moved from place to place and were well manned; the dippers were well filled each cycle and little time was lost. Only when the shovels were on top of the sticky clay bed described were mats needed under them.

Motor-trucks of various makes and owners, some from nearby towns, were kept busy hauling away the spoil from the pit and dumping it in depressions in the immediate vicinity. Their average capacity was 3 yards and the owners were paid 70 cents per load, or 23 cents per yard, for disposal. As many as 47 trucks were at work on one day, when 800 loads were taken away. Sometimes in the pit it was heavy going because of mud and the pull on the incline.

As an approximate average, it took less than one minute for a truck to pull up to a shovel and get away, and another minute or so for the shovel to fill it, a total of about 2 minutes. Of course, this was with a good bank, but throughout the pit the digging was favorable.

Generally, the weather was good. A few wet days and occasional light snow delayed or suspended work, and some days the temperature was 10 to 20 degrees above zero. The ground made a little water, 8,000 gallons per hour, enough to keep a Novo 4-inch double diaphragm closed top pump with a Novo 6-horsepower gasoline engine running during the day and part of the night.

While excavation was under way, the driving of Jones & Laughlin steel sheet piling, by means of a derrick and a No. 7 McKiernan-Terry steam hammer, was started and completed in good time. A total of 27,948 square feet of sheet piling was used, in 20, 30 and 34-foot lengths. Then shoring up and cleaning out from in front of the piling was started, as shown, and was finished about February 27.

PERSONNEL

This text approved for publication by Dr. E. R. Weidlein, Director of Mellon Institute, and by W. A. Hamor, Assistant Director. The Mellon-Stuart Co. is the general contractor for the new building, whose architect is the firm of Janssen & Cocken of Pittsburgh. The *Pittsburgh Post-Gazette* kindly supplied the picture used in this article. W. A. Selvig made the tests on the sand and clay.

River and Highway Bridges Eliminate a Traffic Hazard

(Continued from page 64)

2-bag 10-S mixer was used, discharging into a ½-yard bucket which was raised by a Jaeger hoist in a home-made wood tower. The bucket tower was so constructed that it could be raised as needed when pouring the upper part of the bridges. A rod on the front of the bucket built by the contractor engaged with hooks on the hopper as it was raised, and dumped into the hopper. The elevator bucket was arranged with a cable running through a pair of sheaves at the back which kept the bucket from turning, as it was raised and lowered. The concrete hopper had an Insley gate which discharged the concrete as needed to wheelbarrows.

Concrete was delivered by 4-cubic foot wheelbarrows to wood chutes to the wing foundations. The labor organization for concreting consisted of six carpenters on forms, one craneman, one batcher operator, one mixer man, one hoist man and three men wheeling.

PERSONNEL

George MacLain, of the J. F. Kelly Construction Co., West Haven, Conn., was in charge of the work for the contractor. The work was done under the direction of the State Highway Department, E. V. Stevens, Division Engineer and E. B. Burdick, Resident Engineer.

Our Annual Pilgrimage

With the beginning of the intense activity of the construction season, the Editor of* CONTRACTORS AND ENGINEERS MONTHLY *starts off again to personally inspect and secure first hand information on unusual and outstanding projects for the benefit of our readers. Among the states which he will visit this summer are: Pennsylvania, West Virginia, New Jersey, Connecticut, Michigan, Wisconsin, Minnesota, Iowa, Ohio, Indiana, Illinois and the Province of Ontario.

Machine Finishing Replacing Hand Labor *in* Asphalt Paving Work

By
O. H. Kiest
Blaw-Knox Co.
Pittsburgh, Pa.

IN the construction of asphaltic type pavements, manual labor has been used exclusively for the spreading, leveling and forming of the materials before rolling. It has been the standard practice to haul the mixed material to the place where it is to be used and dump it more or less haphazardly on the base where it is then spread or raked by hand labor. This method has resulted in finished pavements no better than the skill of the men spreading permits. When a contractor was fortunate enough to have a gang of highly skilled laborers he secured excellent results. On the other hand, his brother contractor might not have been so fortunate in his labor and the resulting work would be of a poor grade.

With the advent of mechanical spreading methods and the application of steel forms, all work began to show a uniform improvement in riding qualities with increased production and with the resulting favorable comments of the traveling public and a higher degree of improvement in internal structure, as show by engineering research.

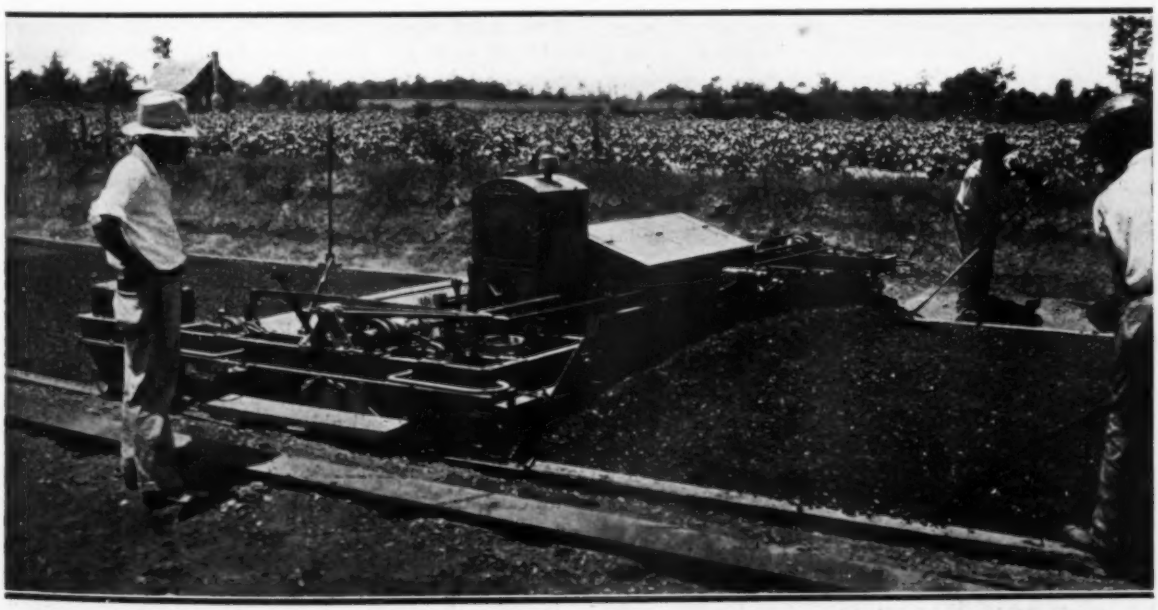
The following items are some of the faults that can be laid to the hand method:

(a) Yardage per day governed by the physical capacity of the human element, and not by the maximum capacity of the mixing plant employed.

b) Increased cost per yard, due to the high wage necessary to secure skilled labor in this particular type of work.

(c) A lack of uniformity in the finished product, requiring correction by so-called "skin patching" after the pavement is rolled.

(d) A pronounced lack of uniformity in thickness and density, resulting in frequent distortion of the riding surface and at times unnecessary waste of material.



With a Mechanical Finisher It Is a Simple Matter to Obtain Maximum Production with an Even Distribution of Aggregates and a Uniformly Smooth Riding Surface

A Mechanical Finisher Handling Asphaltic Concrete

RESULTS SECURED FROM MACHINE FINISHING

During 1926, with the cooperation of certain highway engineers and contractors, mechanical finishing machines, as used for finishing concrete pavements, were tried on asphaltic concrete pavements as laid in California, with surprising results. Although extended use has been slow, it is now a recognized fact that the mechanical method is so far superior to the hand method that certain state highway departments specify its use exclusively.

Up to the present, mechanical finishing machines have handled all the different mixes with the exception of the so-called patented types, which are exceedingly tough or sticky or have an extremely thin wearing coat which is rolled integral with the base. Although some improvement has been made in the method of spreading or dumping the mixture preparatory to working with the finisher, a great deal can still be done in this department of asphalt paving construction.

Mechanical finishing machines, when used, have eliminated the necessity of skilled labor. Therefore, what labor is needed may be unskilled and is easily obtainable. Due to the fact that the mechanical finishing machine works on a track, rail or curb, and its strike-off members follow and rest on these while operating, the surface of the finished pavement must, therefore, correspond to the surface of the rail, track or curb. Also due to the fact that the mechanical devices used to strike off and finish are extremely rigid and shaped to the desired contour of the finished pavement, the resulting surface has a true contour and crown. Where the base courses are formed with the same devices, the crown of all courses is equal in all parts, which is a highly desirable feature in this type of construction.

In addition to eliminating the human element of error, it gives the contractor the means of securing a uniform rate of production throughout the day, allowing him, at the same time, to nearly double his production.

As an illustration, consider the hand-raked jobs during the heat of the summer season with the addition of the heat of the material which makes it practically impossible for hand labor to stand up for more than a very short period of time before it is necessary to rest. This necessitates the employment of separate labor to spell each other continually, with the resulting tendency to neglect certain details which are highly important in producing uniform high-grade work.

FURTHER ADVANTAGES OF MACHINE FINISHING

The mechanical finisher operates at the same pace at 6 P. M. as it did at 7 A. M., giving a uniform rate of production throughout the entire working day. Due to the use of the mechanical finishing machine on asphaltic pavement construction, the contractor, state, city or county realizes a saving in material; an increased tonnage output per day with uniform type of finished production throughout the job and over all jobs; a marked decrease in the amount of inspection corrections required, thereby creating a more friendly and cooperative working condition between the contractor, the laborer and the city, state or county doing the work; and, finally, and most important, increased production depending on plant capacity and not labor capacity which heretofore governed the daily output.

CITY AND RURAL TYPES

Since the advent of mechanical means of finishing asphaltic pavements, the fact has developed that it is not uniformly applicable. Taking rural or state and county construction outside of cities, it is safe to say that the mechanical finishing machine can be applied in all cases with very little restriction. On the other hand, city work brings up a multitude of problems resulting in the necessity of each individual job being carefully studied before deciding whether mechanical means are economically practical. For instance, in surveying a proposed city job where it is found that inlets, manholes, intersections and varying widths are numerous,

and obstructions, such as trees, poles and the maintenance of traffic will seriously interrupt the continuous use of a finisher, the cost may be prohibitive, and hand methods, although possibly not giving as fine a finished product, will be far more practicable.

TYPES OF PAVEMENT ON WHICH MACHINE FINISHING IS APPLICABLE

At present it is impossible to state that mechanical methods of finishing can be universally applied to all types of asphaltic mixes. This is due to their peculiar method of application or some particular detail connected with that special work. Generally speaking, most patented mixes cannot be handled mechanically, due to their consistency or method of the application of the various courses. The following mixes can generally be handled efficiently and with a saving to the contractor with a mechanical finishing machine.

1. One or two-course asphaltic concrete which consists of a hot mix of various size stone, sand, dust and asphaltic cement laid on claystone base, lime rock base or concrete base.

2. Two course, binder base and sheet top, which consists of a hot mix for the base, similar to asphaltic concrete and a top course of what is trade-termed "sheet asphalt" consisting of a mix of sand, dust and asphaltic binder.

3. Sand asphalt where the natural sand deposits prevail, the mix consisting of sand and asphaltic binder in varying proportions.

4. Natural rock asphalt, a mined natural product, ground fine and laid cold.

TYPES OF FORMS USED

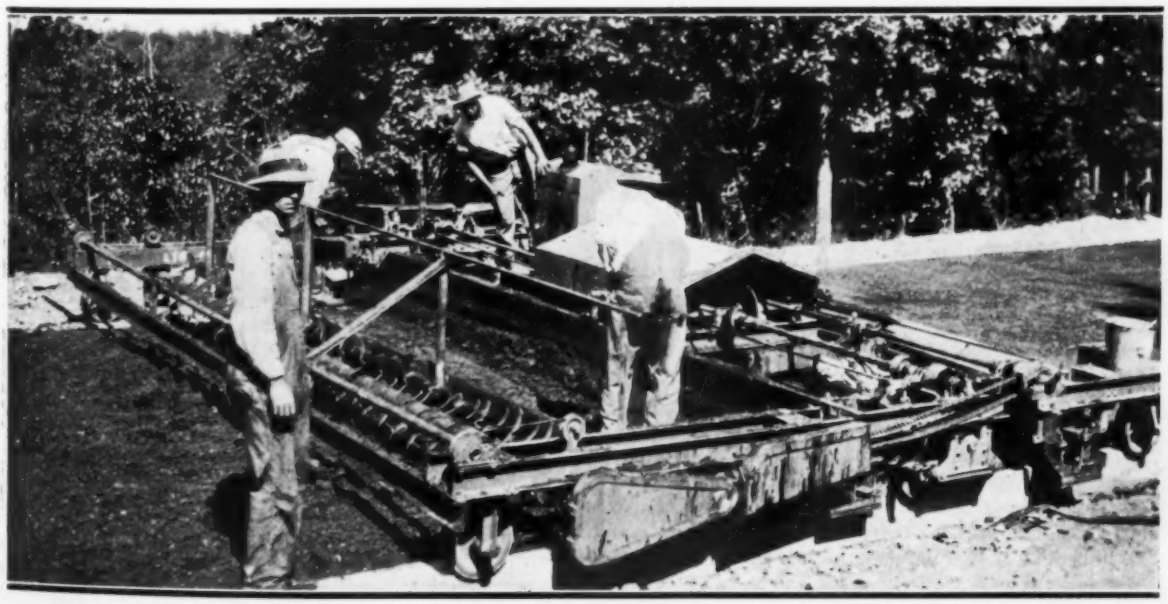
The first requirement necessary to permit the use of a mechanical finishing machine on asphaltic pavement construction is some type of rail on which it can travel and against which it can work the material. The mechanical finisher has finished asphaltic pavements working on the following types of rails:

1. Steel
2. Cut stone curb
3. Concrete curb, integral and concrete base
4. Wood, 3 x 6-inch planks staked flat on clay and gravel base, and 2-inch plank on edge on sand base
5. Special concrete curb requiring a built-in special form structure on a concrete base.

AN ADJUSTABLE SCREED NECESSARY

To successfully handle the many types of pavement, it is necessary to have the strike-off or screed members easily and quickly adjustable. Where the finished surface is flush with the top of the form or curb and only one course, a simple screed member can be used. The only addition needed is either a strip, the thickness of the excess material to be allowed for compaction, laid ahead of the finisher for it to work on, or an attachment fastened to the frame of the finisher, the thickness of the required excess material for compaction, with the screed resting on it rather than on the form.

Where the asphalt is in two courses and it is necessary to finish the base course below the existing curb or forms, one of two methods may be employed. First, the striking off of the base or binder course with a strike-off plate hinged or controlled by a set of manually-operated adjusting screws on the front screed, and set to the required depth to properly strike off the material below the top of the forms, allowing proper excess for compression. Under these conditions the screed proper rides the top of the curb or form. If the top or finished course comes flush with the top of the curb or form, the same method is used as first described for one course work. If the top or finished course lies below the top of the curb and consists of sand or sheet asphalt requiring screeding, the screed or screeds are blocked out underneath to the depth required to finish the top to a height necessary to give the required thickness after compaction.



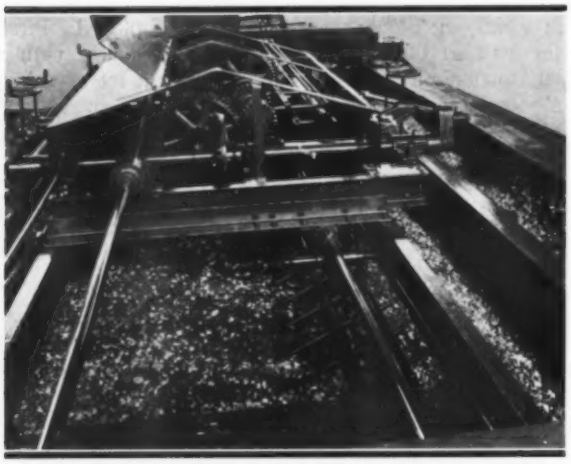
Building a Road of Natural Rock Asphalt with a Mechanical Finisher Equipped with a Fluffing Attachment

FINISHING ASPHALTIC CONCRETE

The State of California has standardized on asphaltic concrete both in new construction and in reclaiming and widening their existing concrete roads. This has led to a great deal of experimentation, leading to the development of a finishing machine for this type of mix. The finisher, as used in California, is the nearest to what can be considered a "pure" asphaltic finisher, designed and built with that only in view. In place of screeds, the material is handled by members which are purely strike-off units having very little, if any, width. Instead of working on forms direct, the strike-off units are suspended on rollers running on tracks attached to the finisher chassis and conforming to the crown of the finished road.

The front plates are quickly adjustable to allow for the change in thickness of the material being spread, so as to allow quick variations in the material depth necessary to be made due to variation in compression.

Between the two screeds, a rake of the sliding type is suspended, which consists of two heavy pipes spanning the road, carried on horizontal guides



A California-Type Machine, Showing the Mounting of the Asphalt Rake Between the Front and Rear Screed for Asphaltic Concrete Work

on which they travel horizontally a maximum of 6 inches. The rake teeth, which consist of steel pins 20 inches in length by ⅝-inch in diameter, are set approximately 6 inches apart in rows staggered so that there is approximately 3 inches of space between the teeth. The teeth are adjustable and point toward the direction of forward travel of the finisher at a working angle of approximately 45 degrees. A means is provided whereby the teeth can be set at various working depths to take care of different thicknesses in courses.

In this type of finisher, the front strike-off members leave the material at a definite height and crown. The rake, then, through its forward and backward motion, gently lifts and shakes the material, redistributing the aggregate. This results in lifting to the surface the coarse aggregate and forming compression ridges. The coarse aggregate being lifted to the surface allows it to be imbedded in the immediate wearing surface by rolling, and thus form a non-skid surface. The compression ridges between the furrows left by the rake teeth have a tendency to assist compression without distortion or travel in the mixture, since the ridges are flattened out sidewise by the roller instead of being driven ahead of it. Up to the present time the heating of the screeds or strike-off plates has been accomplished by letting them absorb heat from the first few loads reaching the job. From then on their continuous contact with the hot mix retains their temperature at a point where very little trouble is experienced by the asphalt adhering to them. It is necessary at times during the early spring and late fall to heat the screeds before applying them to the first batch.

There is a great deal of difference of opinion as to whether it is necessary to rake or fluff all types of asphaltic mixes. Where it is specified or results warrant it, a method of raking or fluffing can be furnished with a mechanical finisher. One has already been described as used in California, another is a series of teeth placed in front of the front screed or strike-off passing back and forth through the mass before it passes under the screed. This combing effect loosens up the mass, helping greatly in the even distribution of the aggregate.

ACKNOWLEDGMENT.—From a paper presented at the Ninth Annual Asphalt Paving Conference at Memphis, Tenn.

Safety Stories

"SAFETY STORIES," the tenth bulletin of the Committee on Accident Prevention of the New York Building Trades Employers' Association, has recently been prepared by the Committee from a subcommittee's report of inspections of the Empire State Building in New York City. The purpose of this Bulletin is to show what has actually been accomplished on the outstanding building construction operation of today and thus give contractors the opportunity of visualizing a concrete example of applied safety, rather than be confounded with theory.

The committee was particularly impressed, during its inspections, with the fact that safety came first with each operation and that expense for safeguards and safety appliances was not spared. This proves that the accumulated experience of the contractors has convinced them that it pays to do a job the safe way.

In addition to the text twenty-five photographs taken on the job are included in the Bulletin, from the demolition of the old Waldorf-Astoria, and the safety methods employed to protect the workmen and pedestrians during the wrecking, to the topping out of the tower. The principal features described are the demolition of the famous hotel, housekeeping or the cleanliness which prevailed at all times on the floors, particularly the ground floor where an average of 250 auto truckloads of material were received daily over a prolonged period; the space provided for prompt entrance of an ambulance in case of call and the hospital just above it for first-aid treatment pending its arrival; and the methods employed in handling materials after delivery to the ground floor.

Other safety features stressed in the Bulletin were the enclosures around the platform hoists which were made up of wire mesh in panels with pivotal bars across the openings, the safety devices on the platform both to lock the cars in place and to lock the platform at the unloading or loading floors while in use, by means of lugs underneath that shot out when operated by a lever; the mine hoist type of temporary elevator that was employed to transport the mechanics and laborers to and from the upper stories, the guarding precautions taken at unused elevator openings; the suspended scaffolds and catch-alls; the signal systems and telephones at every tenth floor.

Copies of this bulletin may be secured by writing to the Secretary of the Commmittee on Accident Prevention, Building Trades Employers Association, 2 Park Ave., New York City.

Legal Points for Contractors

These brief abstracts of court decisions in the contracting field may aid you in avoiding legal difficulties. Local ordinances or state laws may alter the conditions in your community. If in doubt consult your own attorney

Edited by A. L. H. Street, Attorney-at-Law

Order of Engineers Held Premature and Unduly Favorable to Contractor

Just as a jealous wife is apt to be looking for blonde hairs on hubby's coat collar, so an owner occasionally is apt to be suspicious of his engineer being too attentive to the contractor. And once in a while it appears that the engineer has strayed a bit too far away from his "conjugal" duties, although in the best of faith and merely in the course of a platonic friendship.

A Louisiana paving contract, first, specified that all trench sheathing should be so arranged as to permit withdrawal. Then it provided that, when the town engineers should determine that sheathing, etc., be left in place, the contractor should cut off tops, and be paid for sheathing left in place.

What subsequently happened and what the Louisiana Supreme Court thought about it appears in the following extract from the opinion of that court in the case of Terrill Construction Co. v. Town of Pineville, 123 So. 611:

"Before any sheathing was used at all in these trenches, plaintiff company obtained from the engineers of the town of Pineville an order to use 4-inch sheathing in advance of the excavation, and to be left permanently in the trenches. This was done in plain violation of both the letter and the spirit of the contract between the parties. It was an attempt on the part of plaintiff company to saddle upon the town of Pineville the whole cost of temporary sheathing, which had to be placed in the trenches at plaintiff's cost, before any inspection had been made by the engineers, and before any written order had been received from them to leave the sheathing already in place as a permanent support to the walls of the trenches. It is manifest that such order was not binding upon defendant, who had a clear right under the contract to have it rescinded, without being made amenable at all for any breach of the contract."

Subs Were Bound to Make Good Contractor's Profits Lost Through Sub Falling Down on Contract

Instead of breaking rock for a highway job, as they had agreed to do, two subs broke their contract to break the rock. The other party thought this was a bad break for them to make and he litigated his right to damages. The subs knew when they agreed to furnish crushed rock to a contractor at a certain price he had a contract to resell it to a state highway department at a higher price. Therefore, the Nevada Supreme Court decided (Leech v. Armstrong, 283 Pac. 396) that the subs must make the loss good. The court quoted the following well established rule of law, which it will be seen has a very broad application to contracts in general:

"Where a party has contracted to perform labor from which a profit is to spring as a direct result of the work done at a contract price, and is prevented from earning this profit by the wrongful act of another party, his loss is a direct and natural result which the law will presume to follow the breach of the contract. . . . This he will be entitled to establish by showing how much less than the contract price it will cost to do the work or perform the contract."

Owner's Acceptance Terminated Contractor's Responsibility

It may be that "the evil one does may live after him," but that that does not necesasrily mean that he may be held liable in damages for all time to come is shown by the decision announced by the Kansas City Court of Appeals in the case of Cummings v. Halpin, 27 S. W. 2d, 718.

It was assumed that a street grading contractor was negligent in failing to provide a reasonably safe sidewalk for the use of pedestrians who used the street while the work was in progress. But an accident that occurred to a pedestrian did not happen until after the city had accepted the contract work. Hence, the court said that the contractor could not be held liable, although he created the defect that caused the accident. The court made this quotation from an earlier decision in which a bridge contractor was exonerated from liability for an accident occurring after acceptance of the bridge:

"The general rule is that the contractor, after an acceptance of the work by the owner, is not liable to third parties, who had no contractual relations with him, for damages subsequently sustained by reason of his negligence in the performance of his contract duties."

Contractor's Telephone

Contractors who depend to any considerable extent upon the use of telephones in the transaction of business will be interested to read what the South Carolina Supreme Court decided in the recent case of O'Neal v. Citizens' Public Service Co. of South Carolina, 154 S. E. 217.

In that case, the court allowed damages because defendant company discontinued telephone service to a subscriber, because he refused to pay a bill in full, claiming that there had been an interruption of service and that he had not placed as many calls as were charged against him.

Among other things, the court decided that the fact that he may have been delinquent in the payment of a bill for service did not deprive him of the right to use toll stations on paying the proper toll.

The telephone company also claimed that it was the duty of the subscriber to pay the disputed bill under protest and then sue to recover the payment. But the court couldn't see it that way, remarking:

"This would mean that it would be necessary for a telephone subscriber in a dispute over a small amount to engage in expensive litigation to prevent an injury being done to him by the public service corporation. It would be just as reasonable to say that it was the duty of the public service corporation to sue the plaintiff and secure a judgment against him before discontinuing his service. If the public service corporation relied on the correctness of its bill to discontinue service and such bill is found to be correct, it is an absolute defense. If the bill is not correct, however, then the discontinuance is made at the peril of the company."

The opinion also recognizes the right of a telephone subscriber to sue to restrain wrongful cutting off of service or to compel restoration of service already wrongfully discontinued.

The Editor Comments —

Good Will

In all kinds of business there is that intangible asset, which is difficult to evaluate, but which has a great value to any organization. It is built up by an organization through thoughtfulness, fair play and service. Two most excellent examples of good will between distributors of construction equipment and their customers, including contractors, city, town and state engineers, have recently come very forcibly to my attention. In each case it was my privilege to be present and to note the exceedingly friendly spirit existing between merchant and customer.

Last month George Malvese & Co., prominent distributors of construction equipment on Long Island, N. Y., gave their Fifth Annual Banquet in honor of the Town Superintendents of Highways, of Long Island. The banquet was a real reunion of kindred spirits with George Malvese and Mead Stone the ideal hosts. These distributors take the attitude that their annual banquet, the attendance at which numbered over three hundred this year, is not a bid for business, but rather an expression of their appreciation of the faith their large group of customers has shown in them through their extensive purchases of construction equipment. The luncheon, theater ticket, banquet or cigar that is offered as a bid for business may as well be withheld, but the calendar, banquet or something else that is offered as a remembrance, an expression of appreciation of good will, will be recalled often and favorably.

An Example in New England

During a trip through Massachusetts last month it was my privilege to attend the house-warming of the Bond Co., at its new spacious offices and warehouse in South Boston. Here no inducements were offered to the many friendly customers of this well-known organization, merely an invitation was sent out to all friends to attend the house-warming on April 21. Contractors from a very wide territory flocked in, leaving their jobs which had just been started to their superintendents to operate for the day; city, town and state officials came to pay their respects to Harold L. Bond, the gracious, thoughtful president of the organization. Presidents of two of the organizations whose equipment is sold by Bond traveled to Boston to attend the house-warming, other organizations sending their district managers. The genuine spirit of hospitality which pervaded the entire organization, is typical of that warmth which New England is pleased to hide under its cool exterior.

The Cement Situation

Over-expansion, foreign competition, and a very apparent desire on the part of some governmental organizations to beat down prices have lowered the price of cement to a point actually below production costs. Such a condition cannot last without seriously and possibly permanently affecting the fabric of one of the large industries of this country. It is true that consumers, and particularly State Highway Departments, have profited greatly by the drop in price which is now as much as 50 cents a barrel below the price at the beginning of 1931.

No contractor can sell the services of his organization for less than they cost him, without going to the wall. Similarly, the cement industries cannot keep on selling their necessary product below production costs. Such a condition will first affect the manufacturer, but finally, and inevitably the consumer. The quicker both industry and consumers realize that every manufacturer must be paid a reasonable price for his product and every man a reasonable price for a full day's work and that money must not be hoarded, but spent regularly and judiciously, the quicker this country will pull out of the abominable financial quagmire in which it is now wallowing.

As an example of the apparent savings which the fall of the price of cement has brought about, the State of Minnesota recently executed new contracts to replace contracts made last December for 999,982 barrels of cement required for the 247 miles of paving then on the program. These contracts have been executed at the present low market price for the cement needed for the additional pavement made possible by the new bond issue bill and the special Federal Aid. The contracts are on the basis of 90 cents a barrel net in bulk in cars at the mills, plus freight to the station nearest the paving project. The drop in price represents a saving of several hundred thousand dollars. At December prices the price of cement delivered on the job averaged $8,025 per mile of 20-foot concrete. Since freight is a large item in the cost of cement, the delivered prices vary in different parts of the state, but on several of the projects, the new low price will cut the cost of cement more than 25 per cent.

Technological Unemployment

Secretary of Commerce Robert P. Lamont, in a recent address before the U. S. Chamber of Commerce, reminded us that it has too frequently been assumed that technological unemployment is a distinctive characteristic of this business depression and may result in a permanent unemployment problem. This displacement of men by machines has been going on for the past decade but there is ample evidence that these changes have resulted not in unemployment but merely in the shifting of workers from one type of industry to another. This phenomenon is by no means a new one: it has been going on for the past two centuries and it is to be hoped that it will continue in the future.

Theodore Reed Kendall

A Section of
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AND
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News of Consultants
in the
Civil Engineering Field

The Consulting Engineer

May, 1931
New York
Vol. III, No. 5

Proposed Highway and Railroad Toll Bridge Across the Mississippi Near New Orleans

Office of Moran and Proctor, New York

Daniel E. Moran

THE Public Belt Railroad Commission of New Orleans, La., proposes to build a combined highway and railroad toll bridge across the Mississippi River between the 9-mile point and 12-mile point, approximately 2 miles up river from the city line of New Orleans. MORAN AND PROCTOR, 342 Madison Ave., New York City, are the consulting engineers for the design and supervision of the foundation, and Ralph Modjeski, Consulting Engineer, New York City, has charge of the design and general supervision of the project. This proposed bridge, designated as the Mississippi River Crossing, will be the first bridge to be constructed below Vicksburg and is located about 120 miles from the mouth of the river. It will be the first physical connection across the river in the vicinity of New Orleans, and will greatly facilitate highway and railway traffic from the south and west into New Orleans and the country north and east of that point.

The river at the bridge site is approximately 2,500 feet wide from bank to bank and 3,400 feet between the present lines of levees. The maximum depth of water below mean gulf level is 85 to 90 feet.

The main river crossing will include three cantilever spans having an overall length of 1,850 feet, together with a simple span of 530 feet, and four simple spans varying from 268 feet to 335 feet. To the north and south of the main bridge structure, steel viaduct approaches will be constructed. The cantilever channel spans will provide a clear headroom above mean gulf level of 153 feet.

The soil formation underlying the river consists generally of a bed of loose sand varying from 60 to 135 feet in depth, below which is a stratum of gumbo, and under that a layer of packed sand averaging about 100 feet in depth. Below this is another stratum of gumbo approximately 30 feet in thickness, with varying thicknesses of hard packed sand and gumbo below this level. A sandy shale is encountered at elevation approximately minus 490 below mean gulf level.

Pach Bros.
Carlton S. Proctor

The substructure of the main channel spans will consist of open dredged caissons bearing on the hard packed sand stratum at elevation minus 170 below mean gulf level, the caissons being designed to provide a minimum unit load at the bearing level consistent with the weight required for sinking purposes. The short spans on the north side of the river will be supported on wood piles as will also the viaduct approaches.

Change Name of Organization

BEGINNING the first of April, 1931, KAUFFMAN BROTHERS & SONS was changed to I. U. KAUFFMAN & SONS, due to the death last October of the senior member of the firm, O. F. Kauffman. This firm was established in Atlanta in 1900 and some of the leading subdivisions in the south have been built under its supervision. Among these are: Druid Hills, Morningside, Avondale Estates, Ansley Park and Boulevard Park, all of Atlanta. Hogback Mountains, Inc., and Lake Lure, N. C., were in complete charge of Ira U. Kauffman, who was for fifteen years connected with Lockwood Greene Engineers, Inc. Mr. Kauffman now has associated with him, his two sons, R. C. and Wm. R. Kauffman.

The Consulting Engineer

A Section of

Contractors and Engineers Monthly

470 Fourth Avenue, New York

EDGAR J. BUTTENHEIM, President
THEODORE REED KENDALL, Editor
MYRON MACLEOD, Advertising Manager
PRENTICE FORD, Asst. to Pres.

CHICAGO OFFICE, Daily News Plaza
TOM DIX, Vice President
CLEVELAND OFFICE, 642 Hanna Building
GEORGE S. CONOVER, Manager

Contents

J. R. Pennington, Carson City, Nevada, is now working on reports and plans for a new water supply and distribution system at the State Industrial School at Elko, Nevada. Under Mr. Pennington's supervision several Fabco-Tuxham low compression diesel engine power plants are being constructed. In the 1931 issue of *The Municipal Index* will appear the article, "Underground Water—Location and Development" prepared by Mr. Pennington.

Various Works Published by Water Geologist

A NUMBER of papers and reports prepared by HOWARD E. SIMPSON, Ground Water Geologist, University of North Dakota, Grand Forks, N. D., have appeared in various publications. A 312-page report with maps and diagrams was published by the United States Geological Survey under the title "The Geology and Ground Water Resources of North Dakota." A recent issue of *Water Works Engineering* contained an article "Essential Points in Prospecting for City Ground Water Supplies," by Mr. Simpson. A report on the Regina, Saskatchewan, water supply was prepared by Mr. Simpson in collaboration with Nicholas S. Hill, Jr., of New York and R. O. Wynne-Roberts of Toronto and was printed by order of the City Council of Regina. The 1929 Summary Report, Part B, Canadian Geological Survey, Department of Mines, Ottawa, Canada, contains a report "Ground Water Resources of Regina, Saskatchewan," also by Howard E. Simpson.

Howard E. Simpson

New Engineering Firm Announced

CHARLES R. VANNEMAN, former Chief Engineer of the Public Service Commission, Albany, N. Y., has formed a corporation for the general practice of engineering, particularly as it affects public utilities. This firm will be known as CHARLES R. VANNEMAN, INC., State Bank Bldg., Albany, N. Y., with Charles R. Vanneman as President, Newell L. Nussbaumer of Buffalo as Vice-President and Ray P. Diehl, also of Buffalo, as Treasurer.

Mr. Vanneman is a graduate of Cornell University, class of 1903, and since that time has been engaged in public utility work of all kinds. In 1907 he was appointed Engineering Examiner of the State Civil Service Commission and successively held the positions of Inspector of Steam Railroads of the Public Service Commission, Chief of Division of Transportation, Engineer of Grade Crossings and Chief of Division of Steam Railroads. In 1921, he was appointed Chief Engineer of the newly reorganized Commission. In this position he had charge of all engineering incident to the jurisdiction of the Public Service Commission which included steam and electric railroads, electric, gas, steam and telephone plants, bus lines and the elimination of grade crossings.

Newell L. Nussbaumer and Ray P. Diehl have been actively engaged in municipal engineering work in Buffalo and the vicinity. Mr. Diehl will be directly associated with Mr. Vanneman in the Albany office. It is expected that the new firm will taken up immediately the grade crossing elimination work heretofore handled by George C. Diehl, of Buffalo. This includes grade crossing elimination in Troy, Niagara Falls, Tonawanda and North Tonawanda.

Consulting Briefs

Construction Briefs

Prouty Bros. Engineering Co., Exchange Building, Denver, Colo., is at present engaged in the preparation of plans for a heating system for the State Teachers College, Greeley, Colo., and also for an addition to the boiler plant of the National Fuse & Powder Co.

J. G. Reagan, P. O. Box 12, Cisco, Texas, is now working on plans for water purification for the City of Cisco and under his supervision the following construction is now going on: a new concrete pump house, water and sewer extensions, ornamental entrance and fence enclosing Oakwood Cemetery at Cisco, paving at Belmont Park, and additional road construction to the municipal bathing beach for the City of Cisco, general repairs to City Hall Building including painting of the entire building and underpinning portion of the foundation. He is also collecting data for the proposed Federal Fish Hatchery and investigating proposed sites for the Federal Building for the City of Cisco, Texas.

C. N. Harrub Engineering Co., 705 Fourth and First National Bank Bldg., Nashville, Tenn., is now working on reports and plans for a water works installation in Adairville, Ky., and a sewage disposal system in Greeneville, Tenn. Under this company's supervision water works are being installed in Murfreesboro, Tenn. and in Walton, Ky., the contract for the latter having been awarded in February.

O. P. Thomas, Consulting Engineer, 145 Franklin St., Johnstown, Pa., is now working on reports and plans for reinforced concrete paving, sanitary sewers, reinforced concrete river walls and canalization of the Kiskimenetas-Conemaugh River in Pennsylvania. Mr. Thomas was recently called as an expert witness in the case of Westmont Borough vs. Cambria Inclined Plane Co. In December, 1930, Mr. Thomas gave an extemporaneous talk before the Rivers and Harbors Congress at Washington, D. C., his subject being, "Canalization of the Kiskiminetas-Conemaugh River in Pennsylvania."

Charles Brossman, Consulting Engineer, Chamber of Commerce Bldg., Indianapolis, Ind. advises that his office has the following projects under way: a report for iron removal and water filtration for the City of Peru, Ind.; a new steam turbine unit and building for the City of Jasper, Ind., and a new boiler room and boilers for the City of Columbia, Indiana, a new boiler house for the Indiana Boys School, Plainfield, Ind., sewers and sewage disposal plants at Lawrence, Ind., a report to be followed by plans for improving the sewage treatment plant at Franklin, Ind., and street and alley improvements at Delphi, Ind.

Newell, Carter & Walsh, 822 Spalding Bldg., 267 Washington St., Portland, Oregon, are making a study of the cost of hauling logs for the Department of Public Works at Olympia, Washington, this being instigated by the fact that carriers applied for increased rates. This company was recently called as expert witness on the valuation of water rights of Puget Sound Power & Light Co. on Nisqually River condemned by Centralia, Wash.

Hurlbut & Van Vleck, 370 Lexington Ave., New York City, are preparing the structural plans for a 22-story hotel at 40 Central Park South, New York, as well as alterations for several city hospitals.

Nathan H. Sturdy, 229 Chamber of Commerce Bldg., Buffalo, N. Y., is preparing plans for a new plant for the Lake Erie Engineering Corp. The main building, 115 feet by 500 feet, will consist of a foundry 180 feet by 115 feet and a machine and erecting shop, 320 feet by 115 feet. There will also be a storage yard 85 by 500 feet and an office 30 by 60 feet.

Glazier & Morlidge, 403 Broeman Bldg., Cincinnati, Ohio, report that they are now working on plans for a grade elimination on Monmouth Street at the Chesapeake & Ohio and Louisville & Nashville Railways in Newport, Ky., and a garbage incinerator in Ludlow, Ky. Bids have been received on the sewer system and disposal plant at Fort Mitchell, Ky. This company is supervising the construction of sewers in Park Hills.

Stevens & Koon, Consulting Engineers, Spalding Bldg., Portland, Oregon, are now working on plans for a 12-mgd water filtration plant for the City of Eugene, Oregon, which is estimated to cost $300,000. This firm is also supervising the construction of a 6,000-kw auxiliary steam power plant for the City of Eugene, estimated at $450,000, and the installation of a municipal street lighting system using hydroelectric power for the City of Hood River, Oregon, at an estimated cost of $60,000. This company is acting as expert witness in the case of the City of Centralia, Wash. power site condemnation now under way.

Robert Hall Craig, 57 William St., New York City, and 222 North 3rd St., Harrisburg, Penna., is at present working on plans for a sanitary sewer system and a sewage treatment plant for Waynesboro, Penna., a city of 10,140 population.

Rollin F. MacDowell, Civil and Sanitary Engineer, 304 Chester-Twelfth Bldg., Cleveland, Ohio, is preparing plans for a sewage treatment plant for the Village of Hubbard, Ohio. Mr. MacDowell reports that most of the construction work along municipal water and sewerage lines in Ohio is held up at present by an Ohio Supreme Court decision.

Koch & Fowler, 801 Central Bank Bldg., Dallas, Texas, will soon advertise for bids on the Preston Road fresh water District No. 10. Under their supervision the construction of a sewer system and sewage treatment plant at Irving, Texas, is going on.

Robert O. Bradley & Co., Consulting and Constructing Engineers, Chickasha, Okla., are at present preparing plans for the Chickasha, Okla., water works extensions, purification plant, and drainage works and water and sewer extensions at Anadarka, Okla. Under the supervision of this company paving and storm sewers are being constructed in Chickasha, Okla. Robert O. Bradley & Co., were recently called as expert witnesses in the cases of Oklahoma Natural Gas Co. vs. Stephens-Lovett; Stapleton vs. Kuhn, Carnegie, Okla., and the City of Snyder, Okla., vs. Naudane, et. al.

Many Projects Under Way by Mid-West Engineers

R. E. McDonnell

PLANS now being prepared by BURNS & MCDONNELL ENGINEERING CO., 406 Interstate Bldg., Kansas City, Mo., include those for a large lake for recreational and water supply use for Springfield, Ill., at a cost of $2,500,000; a report on the municipal power and light plant and system in Aiken, S. C.; a report for the new intercepting sewer and disposal plant at South Bend, Ind., plans for improving sewage disposal in Sedalia, Mo.; a report on the ten-year improvement plan for the water system in Cincinnati, Ohio; reports on the municipal power and light plant improvements in Marietta, Franklin, Shelby and Piqua, Ohio and Harlan and Mt. Sterling, Ky. This company recently made appraisals for the City of Galveston, Texas, of privately owned electric properties and for the City of Cincinnati, Ohio, for municipally owned water systems. Under the supervision of Burns & McDonnell the following construction is going on: municipal power plant improvement, $1,250,000 at Kansas City, Kansas; a swimming pool at Trenton, Mo.; a water supply system at Beatrice, Neb.; flood control improvements at Winfield, Kansas. R. H. McDonnell and C. S. Timanus recently joined the firm of Burns & McDonnell.

M. P. Hatcher of the organization delivered a lecture on "Factors to be Considered in Swimming Pool Design" before the Kansas Section of the A. W. W. A. In a recent issue of *Municipal Sanitation* appeared an article, "Disposal of Human Wastes" prepared by R. E. McDonnell and in *Public Ownership* Magazine recently appeared the article, "Ponca City, a Tax Free Municipality through its Publicly Owned Utilities" prepared by the staff.

J. W. Howard Incorporates Testing Services

THE well-known inspection service which J. W. Howard has maintained for the past 42 years, has recently been incorporated as the HOWARD INSPECTING & TESTING LABORATORIES, 234 Mt. Prospect Ave., Newark, N. J. Col. Howard has taken this step that some of the stock may be given to his faithful assistants to assure continued work for them and a continuance of the inspection and testing services to states, counties and other clients. There will be no change in the kind or character of services in connection with pavements, bridges, etc.

The Howard Inspecting & Testing Laboratory, Inc., furnishes reports, consultations, investigations, specifications, inspections, analyses and tests of materials such as asphalts, bitumens, concrete, sand, gravel, stone, brick, coal, fuel oil, etc., both during construction and subsequently. Coring tests of pavements are also made by this organization.

Sewerage Projects in New Jersey

WORK now under way in the office of BAUER, KLING & COUDERT, 120 Broad St., Elizabeth, N. J., includes the preparation of a report on the Flemington, N. J., sewerage system and plans and specifications for an internal sewer system for the Borough of Fanwood, N. J. The construction of internal sewer systems for Kenilworth and Clark, N. J., is being carried on under the supervision of this firm.

This firm is made up of J. L. Bauer, State Highway Engineer for the State of New Jersey, Herman Kling, Supervisor of Roads for Union County, New Jersey, and L. L. Coudert. Mr. Bauer is a life member of the American Society of Civil Engineers, President of the New Jersey Association of Engineers and Land Surveyors and Mr. Coudert is an associate member of the American Society of Civil Engineers. This company specializes in municipal engineering and is consulting engineer for the City of Rahway, the Township of Clark and the Borough of Kenilworth, N. J., for the Rahway Valley truck sewer system.

Activities of St. Paul Consultants

A RECENT report from DRUAR & MILINOWSKI, 500-505 Globe Building, St. Paul, Minn., states that this company has completed the preliminary report for a power plant for the Village of St. Charles, Minn., a report on a water works system for Swanville, Minn., and is now making a report for a sewerage and water works system for New York Mills, Minn. Plans have also been completed for a sewerage system for the Village of Frederic, Wis.

J. F. Druar

Construction of the pavements for Pelican Rapids, Minn., the contract for which was let last fall, will commence as early as the weather will permit. The original preliminary report on a sewerage system for Excelsior, Minn., has been revised and it is probable that this work will proceed this season.

Mr. Milinowski recently acted as expert witness in the case of the City of Devil's Lake, N. D., vs. the Western Surety Co., in connection with the construction of an artesian well. He also presented a paper in February before the Minnesota Well Drillers Association on "The Relations Between the Well Driller and the Engineer in Municipal Work." Mr. Milinowski has also been appointed to a board of nine engineers to study and make recommendations regarding the sewage disposal problem for the area comprising the cities of Minneapolis, St. Paul and South St. Paul.

A. S. Milinowski

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Construction Industry News

Chain Belt Co., Milwaukee, Wis., has announced the removal of its Buffalo, N. Y., office from 753 Ellicott Square to 1807 Elmwood Avenue. T. E. Cocker is the District Manager in charge of the Buffalo office.

Pennsylvania-Dixie Cement Corp., 521 Fifth Avenue, New York, has announced the advancement of H. B. Springer to the position of Manager of Contract Sales with headquarters in New York. Clark P. Brown succeeds Mr. Springer as District Sales Manager in charge of the Philadelphia sales office.

Homelite Corp., Port Chester, N. Y., has announced the appointment of J. A. Abbott as Sales Manager. He was previously associated with the Hedge & Mattheis Corp., distributors of contractors' equipment throughout New England.

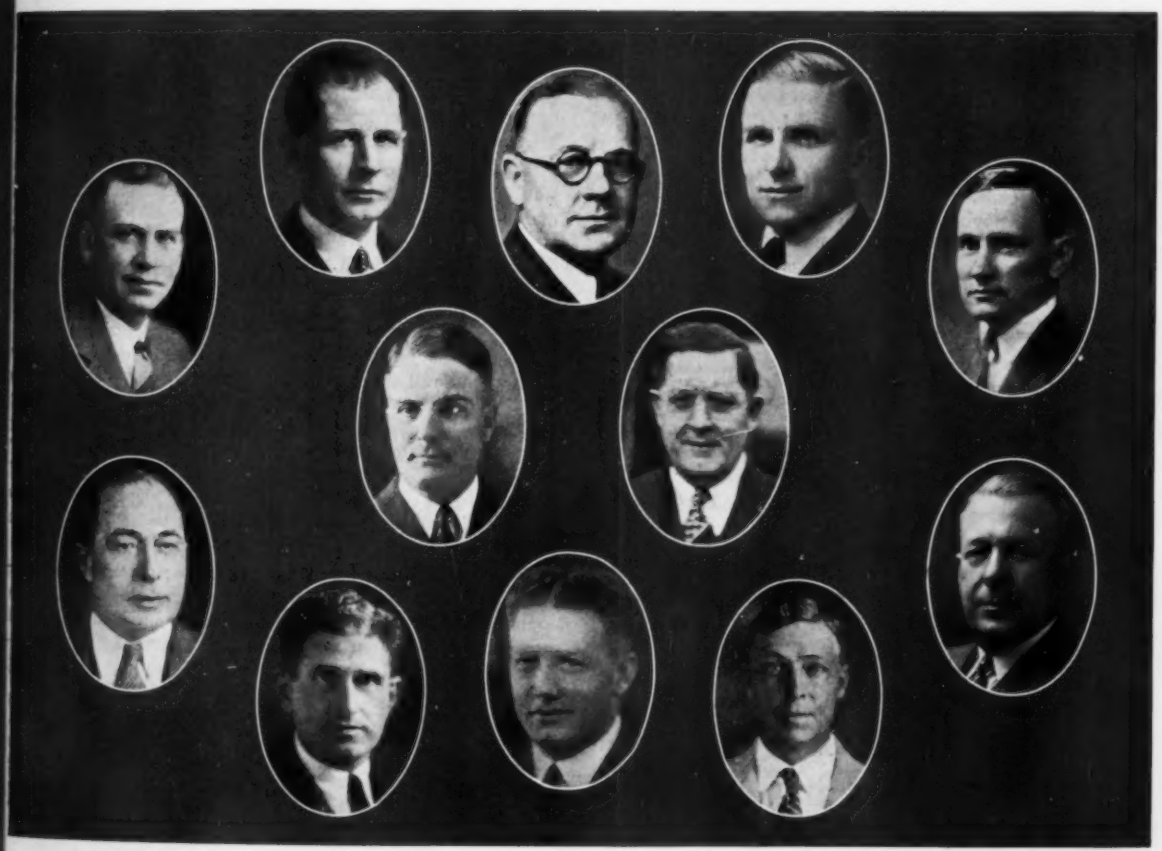
McKiernan-Terry Corp., 19 Park Row, New York, has announced that it has acquired the manufacturing business of the Lambert Hoisting Engine Co., including all of the Lambert designs, patents, patterns, machinery, fixtures and all essential materials for the continued production of the Lambert line. Under the supervision of John A. Lambert, this company will hereafter be known as the Lambert Hoisting Engine Div. of the McKiernan-Terry Corp.

Traylor Engineering & Manufacturing Co., Allentown, Pa., has announced that its New York office, in charge of R. R. Shafter, has been removed from 30 Church Street to Room 2513, Empire State Building, Fifth Avenue and 34th Street.

The Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa., has announced the removal of its New York office from 50 Church St., to 270 Broadway. Howard W. Ford will continue in charge as District Sales Manager.

Bucyrus-Erie Co., South Milwaukee, Wis., has recently taken over the manufacture and sale of the Loadmaster revolving boom crane formerly sold by Frederic H. Poor, Inc., New York City.

1931 Board of Executives of the Associated Equipment Distributors



Top Row, Left to Right: C. E. Baker, Treas. and Sales Mgr., Smith Booth Usher Co., Los Angeles, Calif., 2nd Vice Pres., AED; E. W. Gierke, Gierke-Robinson Co., Davenport, Iowa, Director, AED; Oscar B. Bjorge, Mgr., Clyde Equipment Co., Portland, Ore., Pres., AED; H. O. Penn, Pres., H. O. Penn Machinery Co., Inc., New York, Director, AED; Roy C. Whayne, Roy C. Whayne Supply Co., Louisville, Ky., Director, AED; Center Row: E. K. Hurst, Pres. and Gen. Mgr., Western Material Co., Sioux Falls, S. D., 1st Vice Pres., AED; A. C. Blaisdell, Secy., Queen City Supply Co., Cincinnati, O., Secy., AED; Bottom Row: Robert Nixon, Nixon-Hasselle Co., Chattanooga, Tenn., Director, AED; V. L. Phillips, The Victor L. Phillips Co., Kansas City, Mo., Director, AED; H. W. Fletcher, Pres. Fletcher Equipment Co., Inc., New Orleans, La., Treas., AED; C. H. Neblett, Pres., R. B. Everett & Co., Houston, Texas, Director, AED; Geo. Hillsman, The G. E. Hillsman Co., Chicago, Ill., Director, AED.

Sullivan Machinery Co., 814 Wrigley Building, Chicago, Ill., has announced the appointment of Edwin T. Hall as Manager of its Boston office, succeeding the late George H. Richey.

Hercules Powder Co., Inc., Wilmington, Del., has announced the appointment of Theodore Marvin as Advertising Manager succeeding the late Nelson S. Greensfelder. Mr. Marvin has been Assistant Advertising Manager and Editor of *The Explosives Engineer Magazine* for some time.

The Trackson Co., Milwaukee, Wis., has announced the appointment of the W. H. Williams Co., 835 West Goodale St., Columbus, Ohio, as a new distributor for the complete Trackson line of crawlers, shovels, hoists, cranes, etc.

Link-Belt Co., Chicago, Ill., has announced the appointment of William L. Hartley as District Sales Manager in charge of the Detroit office, located at 5938 Linsdale Ave.

Stephens-Adamson Mfg. Co., Aurora, Ill., has announced the removal of its Chicago office to larger quarters in the Civic Opera Building, 20 North Wacker Drive. C. H. Adamson, Secretary of the company, will be in direct charge of sales and engineering for the Chicago territory.

Truscon Steel Co., Youngstown, Ohio, has announced the appointment of Garrett Counors as Vice President and Director of Purchases in recognition of his ability in his 24 years of service in the production division of Truscon.

The Cleveland Formgrader Co., West 116th St. and Nickel Plate R. R., Cleveland, Ohio, has been organized by four former members of the Lakewood organization, including T. W. Dieckmann, who has been intimately connected with paving equipment sales; J. C. Tullis, who has had extensive experience in shop assembly on paving equipment, and who was also formerly associated with Ted Carr; Elroy Schumacher, who has specialized in the engineering department on paving equipment; and Henry Toole of the purchasing department. This company has already announced a new aluminum straightedge, a subgrade scraper, and an improved formgrader.

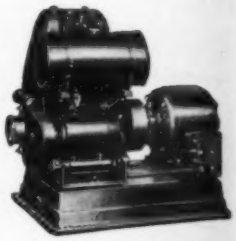
Distributors' Bulletin Board

The distributors of construction equipment listed below have made changes in their cards appearing in the Distributors' Directory on pages 131 *to* 158 *of this issue of* CONTRACTORS AND ENGINEERS MONTHLY:

Edward R. Bacon Co., San Francisco, Calif.
Barnard Tractor & Equipment Co., Inc., Harrisburg, Pa.
Bluefield Supply Co., Bluefield, W. Va.
Bowman-Ralston Tractor & Equipment Co., Evansville, Ind.
The Brown-Bevis Co., Los Angeles, Calif.
Bublitz Machinery Co., Kansas City, Mo.
Crook Co., Los Angeles, Calif.
D. C. Elphinstone, Inc., Baltimore, Md.
R. B. Everett & Co., Houston, Texas
Funkhouser Equipment Co., Kansas City, Mo.
Haverstick & Co., Inc., Rochester, N. Y.
F. H. Hopkins & Co., Montreal, Canada
Just Equipment & Supply Co., Inc., Montreal, Canada
Keystone Builders Supply Co., Rochester, N. Y.
Kratz & McClelland, Inc., San Francisco, Calif.
Lakewood Equipment Co., Saint Louis, Mo.
C. H. Loomis & Co., Newark, N. J.
Louisiana Road Machinery Co., Inc., New Orleans, La.
Henry A. Petter Supply Co., Paducah, Ky.
Thorman W. Rosholt Co., Minneapolis, Minn.
Smith Booth Usher Co., Los Angeles, Calif.
Southern Machinery & Supply Co., Roanoke, Va.
Virginia Road Machinery Co., Inc., Richmond, Va.

Alternating Current Electric Plants

SMALL unit alternating current electric light plants which furnish a bright, steady light and sufficient current for operating small motors have been placed on the market by D. W. Onan & Sons, 39-43 Royalston Ave., Minneapolis, Minn. These plants operate on gasoline and furnish 110-volt, 60-cycle alternating current. A 6-volt starting motor is used for cranking the engine and current for the starting battery is furnished by the generator.



The Onan Electric Light Plant

The Briggs & Stratton gasoline engine is of the 4-cycle, one-cylinder air-cooled type, provided with a constant pump oiling system and a conventional governor to regulate the speed. It is light in weight, all reciprocating parts being of the lightest possible construction, and being self-contained.

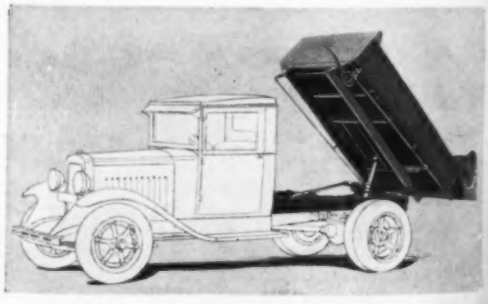
The generator is a duplex unit in construction, having a D. C. winding for excitation and the A. C. winding, both on the same armature. Brushes of a liberal size conduct the direct commutator current and the collector rings with four brushes conduct the A. C. to the lines for service. The A. C. separately excited generator is operated at 1,800 rpm, providing the 60-cycle alternating current of 110 volts. The engine speed is constant, regardless of the load being used. The generator is driven through a special flexible coupling which is designed to eliminate flicker or roughness in operation.

These plants are made in three sizes, 500, 1,000 and 2,000 watts, and in six models, both self-starting from the battery and manual.

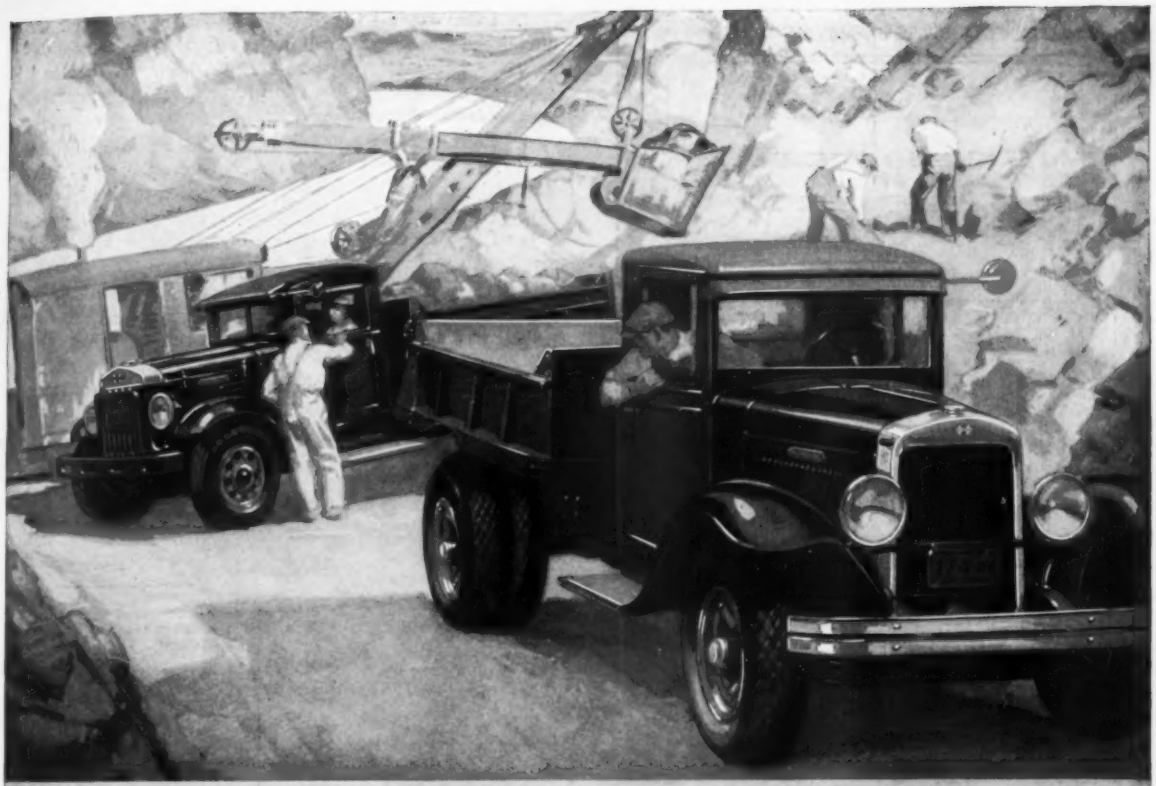
A New Dump Hoist for Light Duty Trucks

A HOIST and body unit for light-duty trucks, known as the WB dump unit, has been announced by the Heil Co., Milwaukee, Wis. This unit consists of a No. 1 Heil single-cylinder hoist mounted in a channel iron supporting frame which fastens to the chassis frame with clips; a Heil power take-off and connected parts; and an all-welded steel body which may be selected. The unit is shipped completely assembled ready for immediate mounting on any 1 or 1½-ton chassis.

The No. 1 Heil hoist is a quick acting powerful hydraulic hoist providing a 50-degree body dumping angle. The hoist pump is an integral part of the hoist and is operated by a power take-off working from the truck transmission. Levers conveniently located in the truck cab control the raising and lowering of the body.



The New Heil WB Dump Unit



BUILDING THE HIGHWAYS OF PENNSYLVANIA

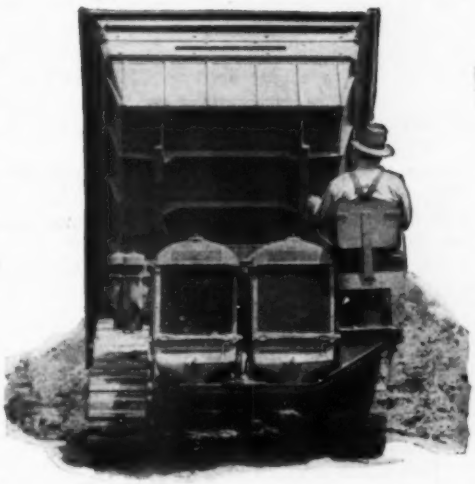
THIS is a story of roads in Pennsylvania—a story of International Trucks. Pennsylvania knows full well that no state can afford to neglect her roads. She has gone on extending the vital arterials so that commerce may flow unobstructed and free. During 1930 over eighty million dollars were invested in major construction, replacement, and maintenance work by the Pennsylvania Department of Highways.

During 1930, over seven hundred International Trucks helped to build the highways of this state alone—a surprising total, indicating the vogue of International haulage among construction men.

Whatever the emergency, Internationals fill the bill and add to their reputation. Everywhere their owners attest their sterling performance and economy. Entrust your own hauling to trucks like these—they will give you both speed and stamina in good measure.

The new International Trucks range from ¾-ton to 5-ton. The nearest of 183 Company-owned branches in the United States and Canada will be glad to demonstrate any model for you.

INTERNATIONAL HARVESTER COMPANY
OF AMERICA
(Incorporated)
606 So. Michigan Ave. Chicago, Illinois

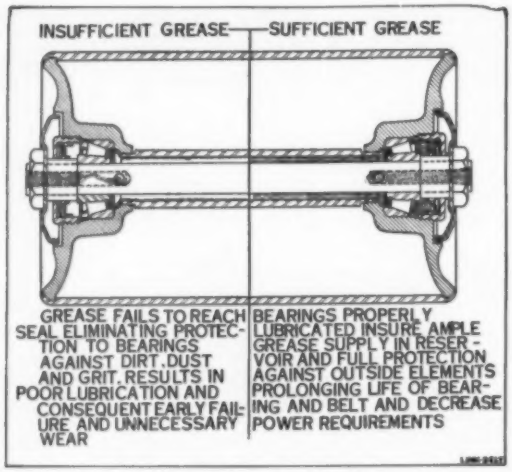


McCORMICK-DEERING POWER

Here is a striking example of the variety of equipment operated by McCormick-Deering Power. Two Power Units are the "heart" of this big dirt-moving unit. Equipment to be powered by McCormick-Deering is built by 120 manufacturers. See the nearest branch, or any McCormick-Deering distributor or dealer.

INTERNATIONAL

INTERNATIONAL TRUCKS



How to Lubricate the Idlers

Making Belt Conveyors Last Longer

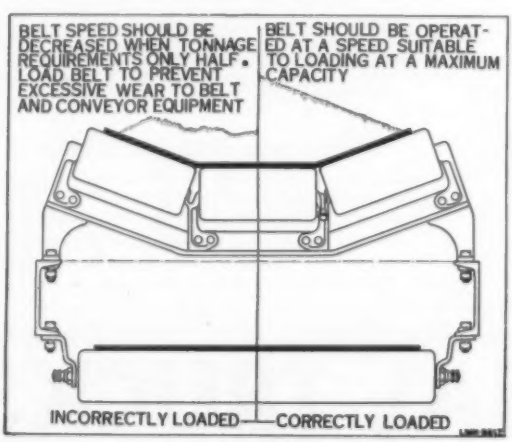
By
W. E. Philips
Engineer, Link-Belt Co., Chicago, Illinois

"HOW can we increase the life of our belt conveyor system?" is a question frequently asked by contractors. As an answer to this popular question, there are five simple things which materially increase the life of the average belt conveyor installation. These things are based on the assumption that when the conveyor was originally installed the idlers were lined up square with the belt; that an experienced engineer's advice was taken when determining on the belt design for the material to be handled; and that the belt was lined up correctly with the idlers.

Even though the original installation was correctly engineered, it requires some attention to get the best results afterward, just as an automobile does if the utmost satisfaction is desired.

The five things which are necessary to prolong the life of a belt conveyor are:

1. Lubrication. Sufficient greasing with the proper kind of grease, although infrequently needed.



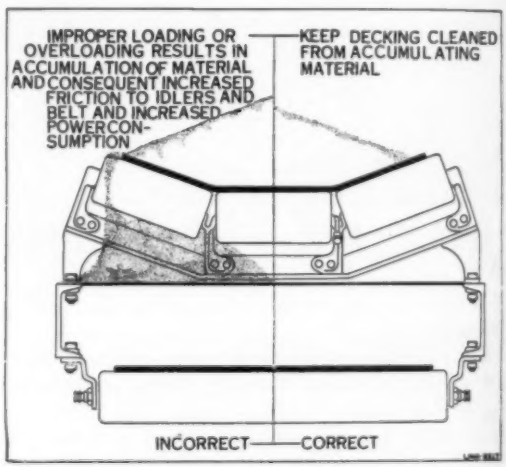
How to Load the Conveyors

2. Cleanliness. Keep the space under the belt clean. Clean the decking when material overflows and threatens to clog the idlers. Clogging increases the friction load, resulting in greater power consumption and wear on the driving mechanism as well as the idlers and belt.

3. Loading. Do not overload. Use an idler sufficiently heavy, and a belt designed for the service expected. Have material reach the belt in the same direction the belt is moving and with as little impact as possible. Use feeders when necessary as they create a steady flow of material without shock to the conveyor.

4. Wear. There are many reasons for uneven or premature wear on belts and idlers. Belts scraping against framework, skirtboards, or wedged material are the chief causes. Dragging idlers, caused by insufficient lubrication, or clogged rolls, cause undue wear on both the belt and idler, and put an extra load on the driving mechanism.

5. Training the belt. Train the belt while empty, then if it runs out of line when loaded it is because of unequal loading. Fix the loading chute or install a feeder. Adjustment cannot be made by taking up the take-ups on one side or the other. See that the belt contacts the center roll of the idler because this roll steers the belt. Foundations for the idler should be firm and secure. Side, or guide idlers, should not be used when training the belt. Do not increase belt tension as this will injure the belt without obtaining the desired results.



How to Keep the Idlers Clean

A New Rock Crusher with Jaw Dimensions of 14 by 28 Inches

A NEW crusher known as the No. 14 cast steel frame Climax crusher has been brought out by the Good Roads Machinery Co., Kennett Square, Penna.

Chief among the improved features of this crusher is the long jaw construction, permitting high capacity and small-sized product without destroying the minimum included angle between the jaws which is a requirement for efficient crushing. This design permits closing the jaws to a minimum of 1 inch. Another feature is the long crushing stroke, enabling the crushed particles to drop further and pass through faster.

The upper and lower fulcrum shaft bearings and the roller and eccentric bearings have been increased in their proportions with a corresponding increase in bearing area. All are equipped with replaceable bushings.

Leaders of Industry

use

Spier Falls Dam and Power Plant, Spier Falls, N. Y.

New Highway Bridge over the Raritan River, New Brunswick, N. J.

Ransome 28-S Mixer in the Central Mixing Plant of McClain Sand Co., Morgantown, W. Va.

Ransome 28-S STANDARD BUILDING MIXERS

Write for Bulletin 124 which tells the story.

Among Many of the Representative Users of the Ransome 28-S Standard Building Mixer are—

THE RAYMOND CONCRETE PILE COMPANY who owns four. They used two of these mixers on the San Francisco Bay Bridge Job.

DWIGHT P. ROBINSON CO. who owns eighteen. Thirteen of these mixers on one job alone mixed over 2,093,000 cubic yards of concrete.

BOOTH & FLINN who own six. They used five on the Holland Vehicular Tunnel.

HYDRO ELECTRIC COMMISSION, ONTARIO, CANADA who had twenty-five mixers on the Queenston Chippewa Power Development.

ULEN & CO. who used six mixers on the Shandaken Tunnel.

STONE & WEBSTER, Inc., who own thirteen.

WILEY MAXON COMPANY who owns two. They mixed over 100,000 cubic yards of concrete on the Susquehanna River Bridge Job.

ARUNDEL CORPORATION who owns three. They mixed all the concrete for the Saluda Dam (largest earth dam in the world).

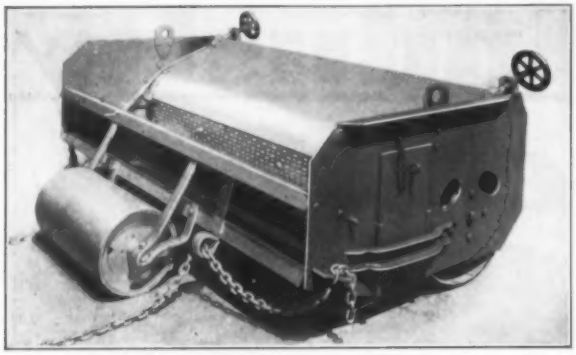
ALLIED ENGINEERING CORPORATION who owns four. They used two on the Spier Falls, N. Y., Project.

CENTRAL MIXING PLANTS. Thirteen 28-S Ransomes are being used in the ready mixed concrete industry. A list of the owners will be sent upon request.

Ransome Concrete Machinery Company

1850—Service for 81 Years—1931

Dunellen New Jersey



The New Handy Rol-Roc

Spreading Base Rock Mechanically

A MACHINE to spread a uniform layer of rock of any size or mixture of sizes, requiring a minimum of hand labor to touch up behind it, and which does not disturb the more or less soft base on which the road is built and requires a minimum of power to draw it, has been put on the market under the name Handy Rol-Roc by Highway Service, Inc., New Bedford, Mass.

The Handy Rol-Roc is a development of the same principle as is used on the Handy Sandy. A revolving roll which travels on the spread stone runs the entire length of the machine, and a steel wire brush regulates the depth of the material spread. This allows spreading of mixed sizes of stone without any tendency to segregate, the larger pieces making their own opening through the regulating brush. The depth of the spread is not governed by the height of the machine above the ground so that in the case of large stones, when spreading mixed material, the depth of spread is not materially affected.

Attachment is made by two chains to any convenient part of the truck, and the machine may be operated by one man only who can spread all the material likely to be brought to any one job in a day, and in most cases has time left to make corrections due to crooked driving or spills from the truck. The depth of the spread may be regulated from 1 inch to 8 inches and the mixture of material such as is often met with in bank gravel or crusher tailings does not affect the spread either in depth or uniformity.

The machine is strongly built for practical road conditions. The main roll revolves on a 3-inch solid steel shaft, and the small front roll is only to support the machine on an even keel when not in use. The attachment of the chains is made in such a way that the pull of the truck practically relieves this roll of all weight. The machine weighs approximately 2,400 pounds. It spreads 8 feet wide and is provided with trap doors, which enable the operator to spread a slight additional width. Adjustment is made by regulating the tension of the steel wire brush against the roll, and is easily adjustable while the machine is in motion for varying depths of material if desired. The width may be changed by inserting plates which cover up that portion of the machine which it is not desired to use, and in this way, various widths of roads may easily be taken care of.

The use of this machine for spreading base rock, with the Handy Sandy for spreading dust or sand used as a filler and covering material gives complete spreading equipment for building any type of macadam road, insuring a more uniform result with lower labor costs.

A One-Man Portable Pump

AN open impeller type pump with a capacity of 15,000 gallons per hour handling dirty, gritty water with a 25-foot suction lift, has been placed on the market by the Sterling Machinery Corp., 2300 Holmes St., Kansas City, Mo. The large capacity of this pumping unit which has a 3-inch suction and 3-inch discharge, is due to its design, the use of Timken roller bearings for both radial and thrust loads and the careful machining of both the impeller and the inside of the case. Being of the open impeller type it is especially adaptable for handling dirty water, such as is found in trenches, foundations and excavations.

The pump and engine are positively aligned, and the design is such as to make it impossible for it to get out of line. This eliminates trouble from flexible couplings, as well as wear and power loss. Air leaks at the packing gland are prevented by the large size of the stuffing box which holds ten rings of ¼-inch packing.

The engine is of the single cylinder, vertical air-cooled, 4-cycle type, and is complete with Wico high tension rotary magneto, carburetor, adjustable governor, muffler, gasoline tank and all accessories, so that the complete unit is ready for operation. The engine is very easy to start, and the engine crankshaft is unusually heavy, being 1⅜ inches in diameter, balanced with counterweights which reduce the vibration. The lower base of the engine forms an oil reservoir from which the oil is raised by a submerged plunger pump driven by an eccentric on the camshaft. Oil is distributed in all vital parts of the engine by the splash system. The engine is of very heavy, sturdy construction, as may be judged from the size of the crankshaft.

On high suction lifts, a few strokes of the hand air pump will prime the pump in less than one minute. This is more simple and satisfactory, according to the manufacturers, than using an auxiliary rotary pump.

The pump and engine are mounted on a sturdy unit of the skid type with wheels at one end and a handle for easy moving at the other end.

The Sterling One-Man Portable Pump

A Diesel-Engine-Driven Portable Air Compressor

THE use of the diesel engine as a power unit on a portable air compressor has been announced by Schramm, Inc., West Chester, Pa. This diesel-engine-driven air compressor is entirely automatic in control and free from vibration. The compressor unit is the standard Schramm 4-cylinder, single-stage vertical water-cooled machine and suitable for 100 pounds maximum working pressure.

The Buda Type MAN diesel is a light weight, high speed full-diesel engine. It possesses all the operating features of heavy-duty gasoline engines, requires practically the same space, and has the advantage of exceptionally low fuel cost.

The complete outfit is mounted on a one piece cast steel frame and is connected to the diesel engine with a heavy-duty self-aligning clutch which permits starting the engine independently of the compressor. The compressor can also be thrown out of service while the engine is operating at maximum full-load speed.

A two-cylinder air-cooled gasoline engine is built in for starting duty. This starting engine is equipped with Bendix drive. A compression release is incorporated in the engine to provide easy starting. The Model-360 Schramm diesel-engine-driven unit has an engine bore of 6 inches and a stroke of 8 inches and operates at 780 rpm. The compressor has a bore of 7⅛ inches and a stroke of 5 inches, there being four compressor cylinders with a displacement of 360 cubic feet per minute. The compressor is equipped with a 20 x 60-inch air tank.

The New Diesel-Engine-Driven Portable Air Compressor

A New Shovel Loader for Dirt Moving

THE new Trackson high shovel for the Model 20 McCormick-Deering tractor is now in production by the Trackson Co., 1323 South First St., Milwaukee, Wis. Equipped with either crawlers or wheels, this shovel digs, moves, and loads materials in one continuous operation with only one man. Although it has a high dumping clearance for loading big trucks, the new machine also has all the advantages of a low lift shovel for digging.

The installation of the Trackson high shovel on the tractor does not interfere in any way with the use of the tractor for drawbar work. The bucket is controlled by a single lever, and an automatic clutch release eliminates the possibility of raising the bucket too high. One of the outstanding improvements of this new shovel is the fact that the bucket is held close to the tractor when it is in the digging position as well as when raised to its maximum height.

The front end drive of the new shovel gives the operator complete control of the bucket, whether the tractor is in operation or standing still, with the clutch disengaged. This is an exclusive Trackson feature and its advantage is in digging in hard materials, since it effects independent crowding action.

The New Trackson High Shovel Mounted on a McCormick-Deering Tractor

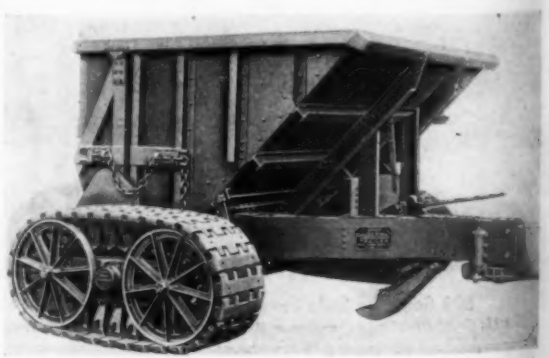
Several new features have been incorporated in the hoisting assembly of the new shovel, such as a Twin-Disc clutch of a type which was especially recommended by the manufacturers for this job, and a special worm gear running on extra heavy ball and roller bearings which reduces the operating speed of the hoisting drums.

An 11-14-Cubic Yard Hopper-Type Rear-Dump Trailer

LARGE capacity has been achieved in the new hopper-type rear-dump trailers which the Athey Truss Wheel Co., 130 North Wells St., Chicago, Ill., has recently added to its line of dirt moving equipment. According to the manufacturer, this new unit not only offers the contractor the advantages of a single unit of large capacity, but owing to its design and method of operation, has proved capable of reducing not only the actual hauling costs, but of affecting worthwhile savings in the handling of material throughout the entire job.

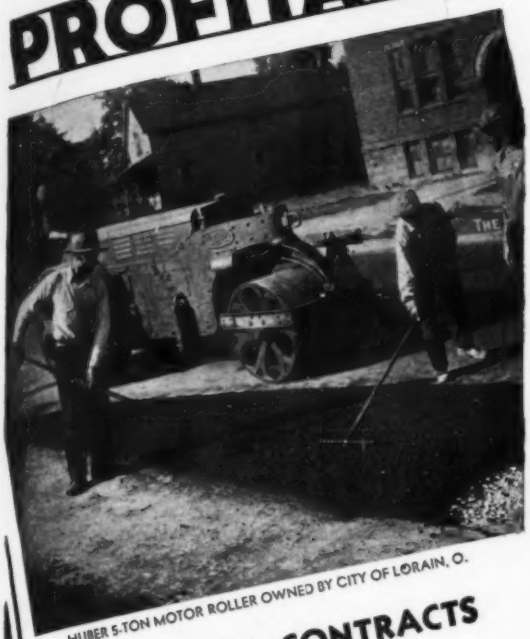
Owing to the hopper type construction of this unit, material can be spread as it is dumped. This trailer is especially adapted for operation on those jobs where specifications require fill material to be laid down in layers, as a simple adjustment is provided on the gate to vary the depth of the layer of material from 6 to 18 inches. Through this preliminary spreading, a reduction in bulldozing is made, which in turn permits hauling equipment and the roller to operate continuously, keeping the shovel working and speeding up the job.

These hopper-type trailers are designed for power shovel loading and the large door permits dumping of any stone or rock which can be handled by the dipper. Dumping is controlled by the tractor operator and the door closes automatically.



The New 11-14-Cubic Yard Hopper-Type Trailer

PROFITABLE



HUBER 5-TON MOTOR ROLLER OWNED BY CITY OF LORAIN, O.

WIN MORE CONTRACTS WITH HUBER

WITH a new Huber on the job, you can land contracts that call for quick action. A Huber with scarifier will tear up old roads—with leveling blade they smooth off the rough places and the rolls compact loose materials. The Huber 10 and 12-ton sizes with sprinkler attachments are widely used for rolling hot asphalt pavements. Built from 5 to 14 tons. Write for new Huber Catalog.

THE HUBER MFG. CO.
330 E. Center St.
MARION, OHIO

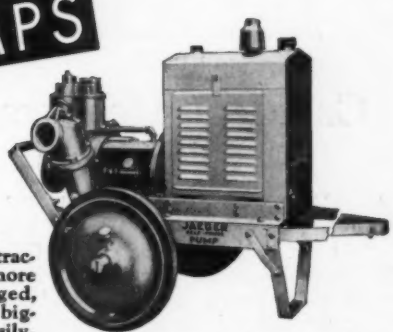
HUB-R
MOTOR ROLLERS

Put It Up to JAEGER Equipment in 1931

MIXERS

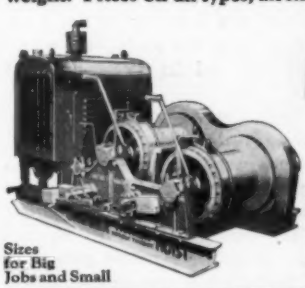
From 3½S trailer to 84S central mix unit, ready to set the pace for low cost construction, a bigger day's work and a profit in close-figured jobs. Improved "Dual-Mix" Tilters double mixing efficiency. Heavy duty Non-Tilt types fit every condition, any job.

PUMPS



1931 Jaeger Contractors' Pumps are more powerful, rugged, efficient, handle bigger volumes easily. Simpler construction and fewer parts reduce total weight. Prices on all types, all sizes, are real 1931 news.

HOISTS



Sizes for Big Jobs and Small

Timken Screw Thrust type, with more speed, more power, more improved features than you've ever been able to buy in any hoist—*at lower prices!* Single and double drum; gas, electric.

WRITE FOR 1931 CATALOG, PRICES!

THE JAEGER MACHINE CO., 701 Dublin Ave., Columbus, Ohio

Send latest catalog and 1931 prices on [ ] Tilting Mixers [ ] Non-Tilt Mixers [ ] Pumps [ ] Timken Thrust Hoists.

Name_____

Address _____

A Clean Method of Handling Bulk Cement from Box Cars

A TWO-WHEELED container designed to assist the contractor to take advantage of the savings made possible by the use of bulk cement and to eliminate the disadvantages of makeshift equipment, has been brought out by the C. S. Johnson Co., Champaign, Ill., in its KoneKart.

As will be noted from its name and from the illustration, the container is cone-shaped with the wider portion at the top. A toggle locked valve provides a bottom discharge which, when used with a canvas spout, avoids the splashing and blowing of cement caused by dumping a tip-over cart into a truck compartment. The valve is tripped and the cement pours into the compartment smoothly and evenly.

The KoneKart is of galvanized steel construction with smooth steep sides, free from internal valleys and providing fast uniform flow. It is made in three sizes to take care of varying mixer batches. Filling is speeded by the large top opening and the support which permits tilting the KoneKart and lowers the shoveling height. The KoneKart has roller bearing wheels which have either pneumatic or steel tires. The bottom valve is tripped by foot.

The Johnson KoneKart

Cast Iron Headwalls for Culverts

A CAST iron headwall, especially designed for use with Spi-Cor spiral corrugated cast iron culvert pipe, is made by the American Casting Co., Birmingham, Ala. This headwall is made up of a lock ring, a back wall, side aprons, and bottom apron. In the adaptation of the headwall to use with Spi-Cor pipe, the inside of the bell is fitted with threads of such diameter and lead as to engage snugly on and prevent endwise movement in relation to the culvert pipe. The internal threads are of two diameters in the same bell, the large diameter being of such size as to engage the outside of the pipe, known as the cuff and the smaller diameter to engage on the inside of the pipe.

The back wall is of such shape as to form the size of back apron desired. A circular opening is provided to allow the bell of the lock ring to enter and other openings are provided to allow the wings of the side aprons to enter and lock in a predetermined relative position to the back wall. The side aprons are made right and left hand and designed to give the desired flare to the headwall. Locking wings are provided to engage openings in the back wall and lock the side aprons in position. Keeper lugs on the lower inside surfaces of the side aprons support the bottom apron and hold it in position. The side aprons are separately locked or keyed to the bottom apron by a cast iron double dove-tail key or casting which engages slots cast in the bottom apron and in the side aprons, respectively. When this key is placed in position it securely locks and holds the parts together.

The bottom apron is a beaded plate made to fit between the lower inside surfaces of the side aprons and hold them apart at the desired angle from the back wall. The bottom apron engages with the lugs of the side aprons, being supported by them or supporting the side walls as the form of the dirt fill may require.

The Upstream End of the American Cast Iron Headwall

Spi-Cor culvert pipe is a short length and light weight cast iron pipe molded in a spiral and corrugated form. It consists of two members, the pipe member and the cuff member. The pipe member is internal diameter to size and the cuff is oversize. The corrugations are spiral as in a screw and the connection between sections is made by screwing the pipe member into the cuff member one complete turn, taking up from 2 2/3 to 4 inches, depending upon the size of the pipe and the lead of the corrugation, which varies from 2 2/3 inches in 15-inch culvert to 4 inches in 36-inch culvert pipe.

Three-Ton Heavy-Duty Trucks

A HEAVY-DUTY commercial truck built from the ground up for the practical use of pneumatic tires and equipped with surplus power for weight, speed and acceleration, faster running speed, easier steering and effective brakes, has been announced by the Reo Motor Car Co., Lansing, Mich. This truck is powered with a Gold Crown engine delivering 70 brake-horsepower at 2,800 rpm. The clutch is rugged, yet smooth acting. The four-speed transmission is roller bearing equipped for long wear and the gears are broad faced and case hardened. The heavily gusseted tapered frame is cross-membered for strength.

The Speed Wagon springs of fine spring steel are low hung, extra wide and extra long. The two-speed rear axle unit available for special hauling requirements gives heavy-duty truck performance. The two-shoe internal expanding brakes are hydraulically operated.

The two-speed axle units give a power range and a speed range which makes it possible to pull heavy loads in or out of

A Reo Model GD 3-Ton Speed Wagon Dump Truck

excavation through mud and sand or up steep grades or maintain relatively high speeds on smooth highways. There are four additional lower speeds forward in the axle unit itself with a gear ratio as low as 77.8 to 1 in the lowest speed.

Every spring shackle and other important parts of the chassis which hitherto have required manual oiling, are equipped with magazine oilers which drip oil onto each frictional part in direct ratio to the amount of agitation and wear the part is receiving. The magazine type of automatic oiling was designed primarily for long distance hauling where vehicles are away from their base of supplies for many days at a time without proper maintenance attention. This type of oiling is, however, equally or more advantageous to trucks operating on shorter routes since the chances of neglect are greatly minimized.

Among the cooling features of the Gold Crown motor are divertive fins inside the water circulating space directing the flow of water, eliminating hot water pockets and keeping even temperatures in all cylinders. The gaskets between the cylinder head and block regulate the flow of cold water to each cylinder according to the distance from the inlet to the cylinder. At the engine peak 6½ gallons of water are delivered through the cylinder every seven seconds. The lubricating oil, cleaned every trip to the bearings, circulates through drilled oil passages instead of oil tubes.

A Caterpillar Twenty Planer with Power-Operated Control

A Patrol or Planer with Power Control

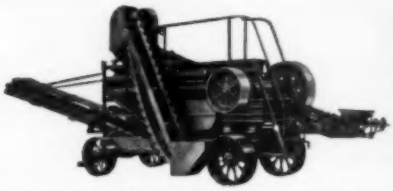
WITH the Caterpillar Trailer Patrol or Planer hitched to a Caterpillar tractor equipped with the new power control, recently announced by the Caterpillar Tractor Co., Peoria, Ill., the operator controls blade operations without manual effort except through the manipulation of conveniently placed control levers. The engine does all the work of lifting or lowering the blade through the power take-off.

In the Fifteen Trailer Patrol, the hand levers before the operator control the mechanical raising or lowering of either end of the blade independently and, in the Twenty Planer, the raising or lowering of the front or rear end independently, thus governing the depth of cut. When the scarifier is used on the Trailer Patrol, either of the two universals from the power take-off can quickly be disconnected from the blade controls and connected to operate the scarifier.

An outfit consisting of a Caterpillar tractor and a hand-control Planer or Trailer Patrol can quickly and easily be changed for power control by the addition of the power control unit.

A Double-Unit Crushing and Screening Plant

A PLANT primarily designed to reduce pit run gravel to ¾-inch material without sacrificing capacity and portability, has been placed on the market by the Diamond Iron Works, Inc., Minneapolis, Minn., in its No. 60 double-unit crushing and screening plant. This portable plant has two crushers, an 8 x 36-inch roller bearing jaw crusher for the primary and 22 x 14-inch rolls for reduction. These are mounted in one compact portable unit.



The Diamond Electrically-Welded Crushing and Screening Plant

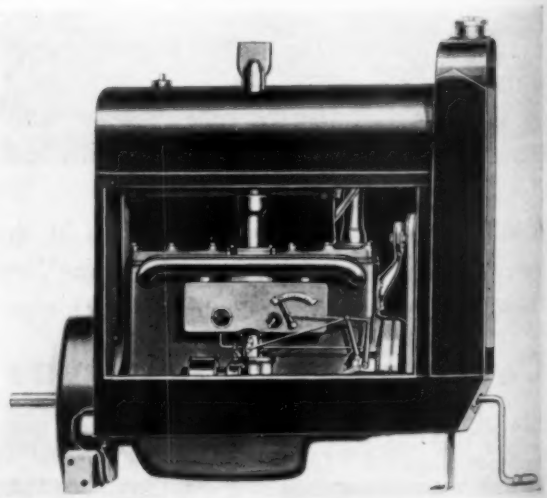
The shaker screen which is hung in ball bearings has an upper screen with 2-inch perforations and a lower screen with openings the size of material desired. The pit-run over 2 inches goes to the primary crusher and all under 2 inches and larger than the perforations to the secondary crusher. The use of two crushers practically doubles the capacity of the single unit plant with very little increase in the power required and necessitates but one operator for the plant.

To avoid unnecessary strains when moving the plant from one pit to another a 3-point suspension is used. The star gears driving the rolls run in oil in an oil-tight gear case, thereby increasing their life about three-fold. If conditions make it desirable these rolls can be disconnected and the plant used as a single unit machine. The entire plant is electrically-welded, no rivets being used in construction.

A New 6-Cylinder Power Unit

AN unusually compact 6-cylinder power unit with 214.7-cubic inch piston displacement and developing 40 horsepower at 1,600 revolutions per minute, has been announced by the Continental Motors Corp., Detroit, Mich. This P-640 power unit has a four-bearing crankshaft with 2¾-inch diameter bearings. The cylinders and crankcase are of nickel chrome iron and the pistons are of the 4-ring type.

The engine is equipped with a 20-inch V-belt-driven fan, the other accessories being driven through a front end train of gears. A mechanical built-in close regulating governor is provided to insure a steady delivery of power from this unit to the equipment being operated. Ignition is either by magneto or distributor. Provision is made for an oil filter and a fuel pump. The lubrication and cooling systems are positively gear driven.



The New Continental P-640 Power Unit

A Metalcurb Installation Under an Asphalt Top

A New Steel Curb for Bituminous Resurfacing

THE rapidly increasing mileage of pavements which, because of the ravages of time and constantly increasing traffic, require resurfacing to extend their lives and protect the public investment, has been responsible for the development of a new type of metal curb which will reduce the cost of curbing in this type of work. The idea was developed by W. H. Mosely, paving engineer of Springfield, Ill., and calls for two strips of metal, one on each side of the pavement, held together by strip steel tie rods running across the pavement at necessary intervals. The rods are buried in the cushion in the case of brick resurfacing or in the asphalt in the case of bituminous resurfacing. The strips are suitably coated to prevent corrosion.

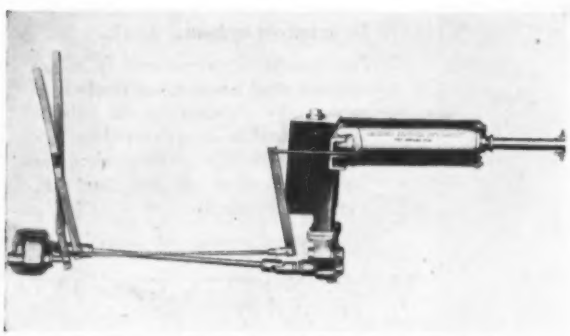
Curbs for resurfacing have heretofore been of concrete 12 or more inches wide and deep. One objection to this form of construction has been that, because the new curb could not be made to bond with the old base, water could seep down between the curb and the base, resulting in an unstable sub-grade. In the case of a brick surface 3 inches thick with a 1-inch cushion, the metal curb, which is being made by the American Rolling Mill Co., Middletown, Ohio, is 6 or 8 inches wide, 4 inches of which extends above the old concrete pavement and the balance rests against the side of the old concrete pavement and is held rigidly in place by the tie rods.

Designs have also been worked out for secondary pavements. Much of the maintenance cost on such types of pavement is due to the outer edges breaking down under traffic and holes developing which become a menace to fast moving traffic. The metal curb will confine the bituminous top and keep it in place, and shoulders can be built up outside the curb on either side. Anchor rods or stakes driven deep into the gravel or crushed stone sub-base anchor the curb in place and steel tie rods insure its stability.

An experimental section of the new metal curb has already been laid near Springfield, Ill.

A Heavy-Duty Pipeless Hydraulic Hoist Dump Body

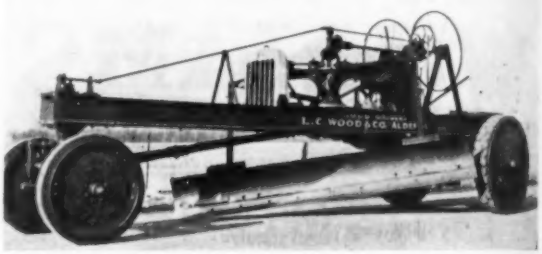
AN hydraulic dump body hoist which has no piping or connections to blow out, leak or give way under the vibration of the trucks, has been announced by the Anthony Co., Inc., Streator, Ill. This hoist supplies a large surplus lifting capacity through the use of a 6-inch cylinder. The working pressure is reduced to a minimum, requiring approximately 200 pounds less oil pressure than on other similar hoists. A 3-point lifting mechanism dumps the complete load wherever the truck may stand, regardless of twists or frame weaves.



The Pump and Cylinder Used on the New Anthony Heavy-Duty Hydraulic Hoist Dump Body

The hoist carries one gallon of oil in reserve in the reservoir, preventing air locks and the necessary stopping to add oil. This also permits the body to raise to the maximum dumping angle at any time. The body cannot drop from the dumped position when released whether loaded or empty, but rapidly returns, settling on a cushion of oil, thus preventing damage to the chassis. The body can be stopped, lowered and held in position and can also be held, lowered or raised, while the truck is in motion. The dumping angle is 50 degrees.

The body has an extremely low loading height and the bottom of the box is only 11½ inches from the frame. It has a high tailgate clearance level with the truck frame. The dumping is controlled entirely from the cab by one power take-off lever and one hoist control lever.



The New Wood Road Grader-Maintainer Shown as a Powered Maintainer

A New Road Grader and Maintainer

A NEW road grader-maintainer which may be used either as a pulled grader or as a powered maintainer, has recently been announced by L. C. Wood & Co., Alden, Iowa. The construction of this machine is somewhat novel in that it has no circle but a straight and rigid frame and a pushed blade. The machine is rubber-tired and in operation as a maintainer is powered by a 40-horsepower motor which rolls it along at from a crawl in low to 8½ miles in fourth speed. The blade has the whole weight of the machine to hold it from vibrating or raising over uneven places in the road.

To use it as a pulled grader, the tongue is dropped from its bracket, swung around in front and is ready for the tractor to hook on. The rear wheel at the heel of the blade cranks out to clear the furrow of dirt from the blade, and the axle is angled against the load. The blade, in any working angle, raises up against the frame and gives plenty of clearance for any condition. The machine pulls up out of a ditch or up onto a high fill without marring the shoulder of the road. The blade is easily lowered into even very hard material and easily raised again as the weight of the blade is carried by a pair of springs.

This two-purpose machine has a rigid I-beam V-shaped frame held together by ¾ plates and 8-inch pipes, blade control and steel disc wheels.

. . . . FOR BIG LOADS, HEAVY LOADS, YOU NEED HEAVY-DUTY TRUCKS

Dodge Trucks like this one are carrying capacity loads daily for contractors everywhere

For heavy-duty hauling in your industry you need trucks that will haul heavy loads. » » Dodge Heavy-Duty Trucks will do that. They are rugged in design and construction through and through. Everything about them says *heavy duty*. Everything about them says *power*, says *dependability*, says *long life at low cost*. » » Whatever your heavy-duty hauling needs may be . . . whether you must head up steep hills often or over unimproved roads daily . . . there is a Dodge Heavy-Duty Truck for your job. A Dodge Truck that's modern. That's precision-built throughout and correctly balanced part to part for longer life. A truck that's dependable. That's economical. That will work for you and earn for you as no other truck will do.

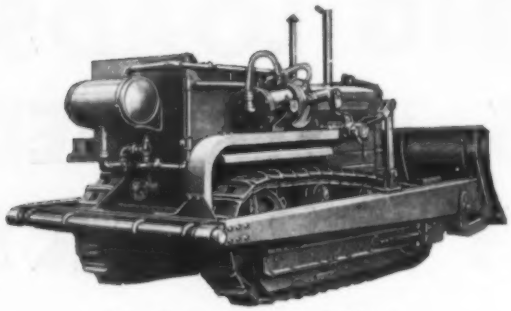
» » See your Dodge Brothers dealer. See and test the Dodge Heavy-Duty Truck that fits your needs. You can buy it complete with standard or special body. You will find it an exceptional value—a loyal worker, a consistent earner.

THE COMPLETE LINE OF DODGE TRUCKS RANGES IN PAYLOAD CAPACITIES FROM 1,200 TO 11,175 POUNDS—PRICED, CHASSIS F. O. B. DETROIT, FROM $435 TO $2695, INCLUDING THE 1½-TON CHASSIS AT $595

TO HELP LOWER YOUR HAULING COSTS
OPERATING RECORD BOOK FREE

DODGE BROTHERS CORPORATION A-10
Detroit, Michigan
Send your Operating Record Book. I understand there is no obligation.
NAME_____
ADDRESS_____
CITY_____ STATE_____
Number of Trucks Operated *(Book for each will be sent)*_____

DEPENDABLE DODGE TRUCKS



The Bates Hydraulic Bulldozer

A New Hydraulic Bulldozer

A HYDRAULIC bulldozer built especially for use in combination with Bates crawler-type road tractors has been announced by Foote Bros. Gear & Machine Co., 111 N. Canal St., Chicago, Ill. In addition to having a simplified design and exceptional sturdiness, all of the operating mechanism is located below the level of the seat, giving clear vision to the operator. The oil pump is started or stopped by throwing the small clutch lever located below the driver's seat. When in operation the control of the oil pressure in the hydraulic ram raises or lowers the blade of the bulldozer in 2 to 4 seconds time, dependnig on the blade clearance at the time.

A 3-way valve controls the oil supply. One position of the valve handle forces the oil in at one end of the cylinder and lowers the blade. In another position it forces the oil in at the opposite end of the cylinder and raises the blade. The neutral position bypasses the oil back to the tank and holds the blade at any height desired.

This bulldozer is built with a heavy frame with considerable ground clearance. The frame is so attached that it does not interfere with the normal operation of the tractor. It is bolted to the tractor frame at the back of the tractor and the lifting mechanism is attached to the tractor frame just behind the engine.

The major portion of the weight of the bulldozer is carried in the blade with the pivot point at the rear of the frame. The action of the lifting mechanism located halfway between the pivot point and the blade on the bulldozer frame throws all the weight to the front and holds the tractor and the bulldozer blade into the ground to do the work.

Adjustable shoes are mounted on the frame just back of the blade. These shoes serve as front runners for the bulldozer and also prevent the blade from digging into the ground. They are adjustable so that the blade can be raised several inches from the ground for filling in and leveling dumps. The moldboard is constructed of heavy reinforced steel plate and at the bottom has a wide cutting edge.

A Manganese Steel Welding Rod

SEVERAL years ago, because no existing welding rod was quite satisfactory for its use, the Research Department of the American Manganese Steel Co., Inc., Chicago Heights, Ill., developed the Amsco manganese steel welding rod for its own use. The performance of this rod has been so successful that it is now being sold to contractors who have a need for it. The composition is covered by patent applications, but its manganese content is known to be from 13.5 to 14 per cent. This, with other important elements, gives a deposit with the electric arc welder without heat treatment equal in toughness and wear-resistance to manganese steel. It may be used for repairing or building up either manganese steel castings or other steel. It is stocked in A. S. & W. gage No. 5, 36 inches long.

For hard-surfacing, the Amsco 459 welding rod is available. It is more resistant to abrasion and has been found economical for hard-surfacing dipper teeth, pulverizer hammers and other parts subjected to severe wearing action. Amsco 459 is a cast rod about 5/16-inch in diameter.

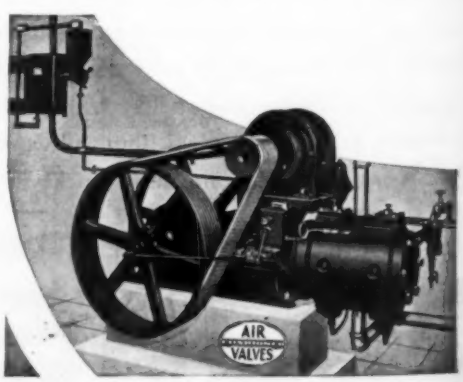
Economical Compressed Air for Semi-Permanent Installations

THE problem of the air compressor user on semi-permanent installations such as quarries, is to select a compressor which will most closely meet the working conditions of the plant. In many cases these conditions vary from continuous operation of the compressor for 8 to 24 hours a day to a combination of continuous and intermittent operation. When all tools and appliances using air are in service, the full air capacity of a compressor is required. On the other hand, when some equipment is not in use, only part of the air capacity of the compressor is needed.

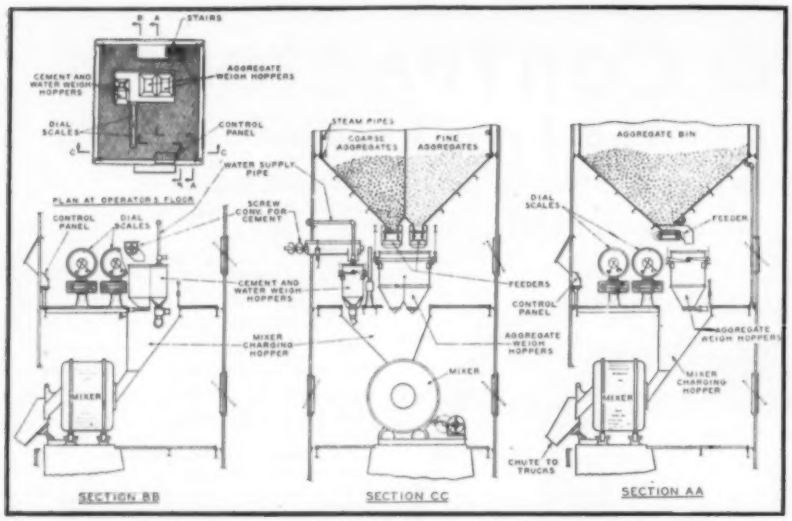
As it is necessary to select a compressor of sufficient capacity to deliver the maximum volume of air when all equipment is in use, the result is, when the compressor is arranged for continuous operation only, a waste of power and unnecessary wear on the machine during such periods as it is operating in an unloaded condition.

Pennsylvania dual compressor control was developed by the Pennsylvania Pump & Compressor Co., Easton, Pa., especially to meet these varying demands for compressed air. With this method of regulation, a compressor can be operated to take care either of the maximum or minimum demand covering continuous operation for maximum demand and automatic stop and start for minimum demand. Thus, only sufficient air is compressed to take care of the demand during any condition of operation. This results in lowered power consumption with a corresponding reduction in the cost of power and the elimination of wear on the compressor during unloaded periods.

Economy of floor space is an advantage offered by Pennsylvania compressors in multiple belt-driven units. Multiple-belt drives, because of their short centers provide compact installations. These drives are available in both overhead and horizontal types of motor mountings. On the overhead drive the motor is mounted on the compressor frame, while in the horizontal drive, the motor is mounted in the same plane with the compressor. The compressors are equipped with air-cushioned valves in which a grooved recess or pocket in the guard forms an air cushion for the valve disc. This prevents the disc from striking the guard, producing quiet operation. Instead of holding the guard and seat together by bolt and nut they are held by a retainer ring which snaps in place.



A Pennsylvania Air Compressor with Dual Control



Plan and Sections of the S-A Automatic Central Proportioning Plant

Complete Ready-Mixed Concrete Plants

WITH universal dependence upon structural concrete, commercial central mixing plants should utilize every available method for the production of concrete of uniform quality and strength. Stephens-Adamson Mfg. Co., Aurora, Ill., designs and builds complete plants and equipment for producing ready-mixed concrete. The new S-A system for automatically accomplishing the accurate proportioning of the concrete batch for central mixing plants is of interest to those considering this new commercial project.

In the new plant the measurement of cement, sand, aggregate and water is done by weight, using the Toledo springless dial scale. The load is always plainly registered and easily visible on the large dial. With the regular dial scale mechanism is furnished an aggregate moisture determination Auto Gage which was described in these columns in March, 1931, page 102.

An electric photo-cell contributes to the automatic operation of the scales and batching equipment. Set a predetermined weight on the dial, and these photo-cells instantly close a relay switch when the prescribed amount is reached. Push button starters, ingenious electric interlock, tell-tale pilot light, all add to the ease and simplicity of operation with its attendant automatic features. On a centrally located control panel are mounted all of the push buttons for the motor starters. To charge the weighing hoppers with aggregate the operator views the control panel to determine by the pilot light indicators that the bottom discharge gates of the weigh hoppers are closed. A push button control starts the feeder withdrawing the fine aggregates from the storage bins. As the material is being delivered to the weigh hopper the move of the dial arrow shows the amount at all times. When the correct amount has been delivered the photo-cell is automatically interrupted by the dial arrow, and instantly shuts off the flow by stopping the feeder.

The poise of the coarse aggregate which has been put at the neutral position is now moved to the stop bar on the beam. Only when this poise is at the stop bar is electric current available for operating the coarse aggregate feeder due to an electrical interlock. The operator then presses a push button which starts the coarse aggregate feeder. When the prescribed amount of coarse aggregate is delivered from the storage bin to the weigh hopper, the photo-cell is interrupted by the dial arrow and the flow of material instantly ceases when the feeder stops.

Identically the same procedure is followed on the second scale in the accurate weighing of the prescribed amount of cement and water for the batch. In actual operation the operator pushes the button for the fine aggregate feeder delivering into one hopper, and the push button starting the cement conveyor delivering to the second weigh hopper. As soon as these two ingredients have been drawn into the weigh hoppers the pilot lights will flash to indicate completion. The operator then shifts the poises into position and engages the push button starters for the other two materials.

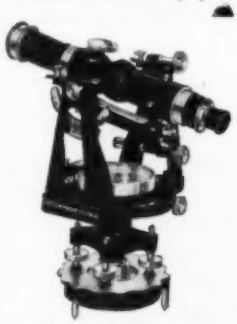
When the hoppers have been filled with the correct amount of materials, the operator is ready to discharge the batch, either directly into the mixer or into trucks or transit mixers. A master push button control releases the fine aggregate, the coarse aggregate and the cement as a dry mix. The release and discharge of the water is independently controlled. The discharge valves are so arranged that they cannot be closed until they are completely emptied. On the control panel are switches for the remote control of the plant mixer discharge spout operated by motor winches.

A New Combination Transit and Level

A NEW Transit-Level, which is made either with or without compass and with or without a vertical arc, as desired, has been developed by the Warren-Knight Co., 136 North 12th St., Philadelphia, Pa. This instrument is the result of an ever-increasing demand for a combination instrument which can be used for both transit and level work without the necessity for changing the instrument in any way.

The instrument is entirely new in design with a new optical system and new dual bearing standards, as well as a new and exclusive feature which enables the adjustments of the telescope and level to be checked as easily and in the same way as an ordinary wye level. It is an accurate, compact instrument, conveniently packed in a substantial hardwood carrying case, complete with trivet, plumb bob, reading glass, sunshade and tripod.

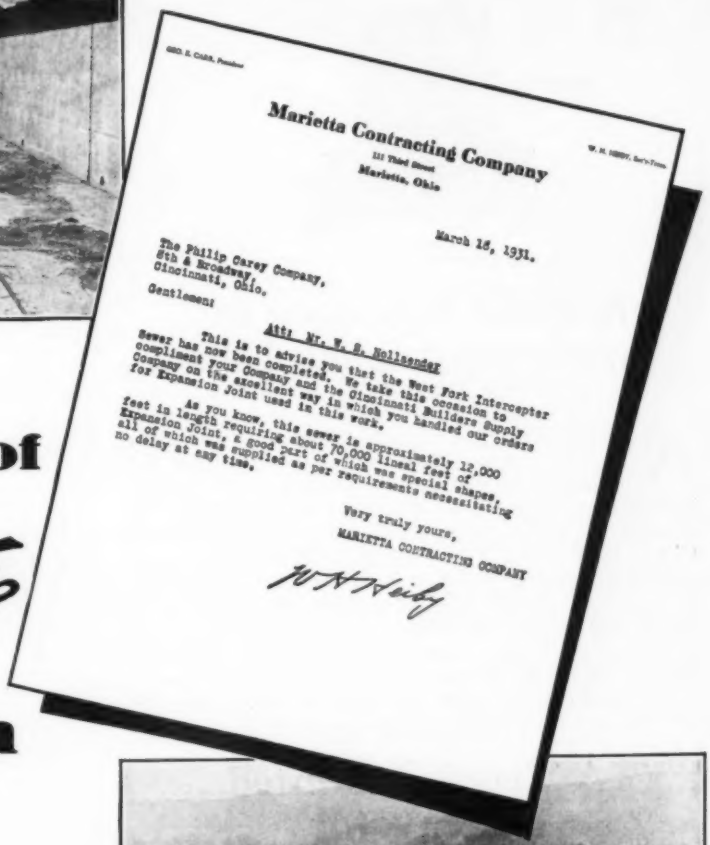
The Transit-Level has a maximum tilt of 110 degrees from 55 degrees above to 55 degrees below the horizontal. The horizontal or graduated circle has a vernier reading to single minutes and is fully protected by a heavily ribbed top plate.



The New Warren-Knight Transit-Level

The telescope with level attached is provided with a clamp and tangent for quickly and accurately taking level readings and has lenses with magnifying power of 22 diameters and a special combination which enables a sharp sight as close as 4 feet from the center of the instrument. The instrument itself has a full three-quarter inch shift on the tripod plate. The tripod plate and tripod are furnished with U. S. Standard thread and the tripod plate is equipped with three detachable pins, enabling the plate to be used as a trivet.

This Transit-Level is particularly adapted for grading and excavating, building roads and bridges, lines and grades on curbs, gutters, water and sewer lines and similar projects.



Marietta Contracting Company
111 Third Street
Marietta, Ohio

March 18, 1931.

The Philip Carey Company,
6th & Broadway,
Cincinnati, Ohio.

Gentlemen

Attn: Mr. W. S. Hollaender

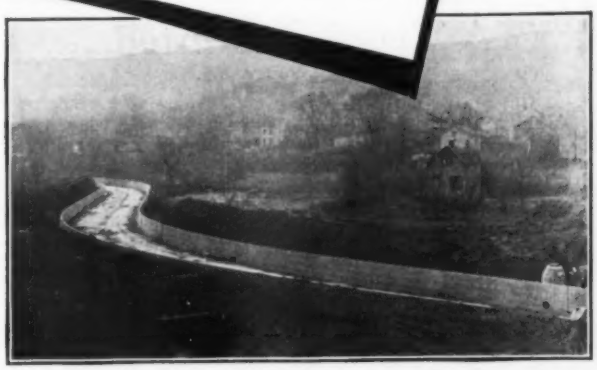
This is to advise you that the West Fork Interceptor Sewer has now been completed. We take this occasion to compliment your Company and the Cincinnati Builders Supply Company on the excellent way in which you handled our orders for Expansion Joint used in this work.

As you know, this sewer is approximately 12,000 feet in length requiring about 70,000 lineal feet of Expansion Joint, a good part of which was special shapes, all of which was supplied as per requirements necessitating no delay at any time.

Very truly yours,
MARIETTA CONTRACTING COMPANY

70,000 feet of Carey Elastite Expansion Joint

"No delay at any time"



Here is another outstanding example of concrete construction—an interceptor sewer 12,000 feet long. Although the Expansion Joint had to be cut to special size, Carey Elastite Joint was delivered as required and on short notice.

Important concrete construction requiring Expansion Joint is almost always protected by Carey Elastite Joint, because the quality of the material and the certainty of its prompt delivery have been proved by 20 years of experience.

A nation-wide organization of distributors, carrying large stocks, insures that any order for standard or special sizes can be delivered on the job in the shortest possible time.

Write for 1931 Price List and Trade Discounts.

THE PHILIP CAREY COMPANY × Lockland, Cincinnati, Ohio
Branches in Principal Cities

BUILT-UP ROOFS
ASPHALT PRODUCTS
ELASTITE EXPANSION JOINT
WATERPROOFINGS
ROOF PAINTS

Carey PRODUCTS

HEAT INSULATIONS
ASBESTOS MATERIALS
CAREYSTONE CORRUGATED SIDING
ASFALTSLATE SHINGLES
BUILDING PAPERS

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A Littleford Hand Squeegee

A Hand Squeegee for Applying Asphalt Filler to Brick

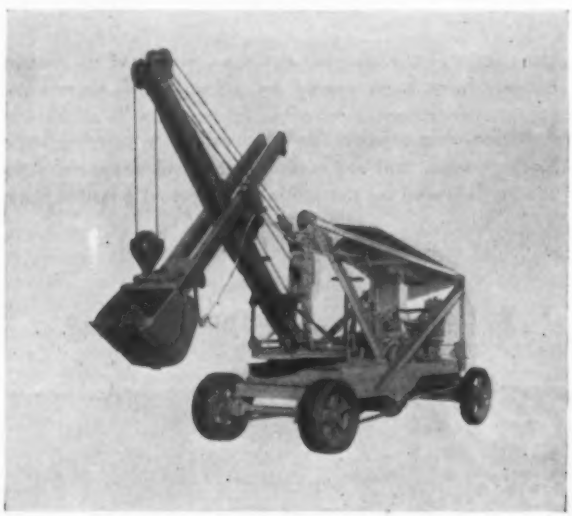
A SQUEEGEE machine which performs two operations at one time in that it distributes the asphalt and squeegees the material over the surfaces of the brick, has been developed in the No. 82 squeegee machine of Littleford Brothers, 485 East Pearl St., Cincinnati, Ohio. The asphaltic filler or mastic is drawn from a large kettle into the squeegee machine and then the flow from the machine is regulated by a discharge valve operated from the handle by which the machine is pushed by one man. The asphaltic filler is discharged in front of a heavy curved wiper blade. This machine is used extensively to apply filler on granite, brick and wood block paving and has been found very satisfactory for the application of the seal coat on small asphaltic concrete jobs.

A Truck-Mounted Excavator

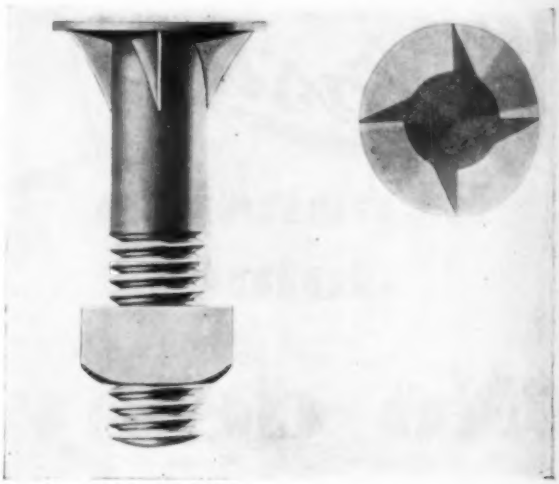
A ½-YARD excavator traveling on rubber-tired wheels at motor truck speed is the offering of the Byers Excavator Co., Ravenna, Ohio, in its new Model 50. This machine is the Byers Model 40 mounted on its own simplified motor truck with a base consisting principally of rubber-tired wheels, motor truck type of steer, motor transmission and differential. The distance from the ground to the boom foot pin is approximately the same as a crawler mounted unit. Consequently, the shovel, crane, dragline or trencher attachment operates equally well. Its high travel speed of approximately 8 miles per hour and interchangeable attachments combine the advantages of a small shovel or crane with automobile travel. Only one man is required to operate this excavator as the steering staff is located conveniently to the operating levers. The weight of the machine is only 10 tons which permits its traveling over light country bridges and the powerful 36-horsepower motor is sufficient to propel the machine up steep grades and operate it in hard material.

The excavator has an independent reversible cable crowd on the shovel and the shovel dipper has a 10-cubic foot struck measure capacity or ½-yard usual fill.

The excavator is equipped with standard automotive parts, has three-speed transmission, a high quality differential and sharp-angle steering, enabling it to turn close corners. It has a width of 92 or 96 inches overall to comply with state highway rulings. The steering axle is of standard truck design. The mounting is of the 3-point suspension type. The rubber-tired front wheels, 37 inches in diameter, have a 9-inch face and the rubber-tired rear wheels, 38 inches in diameter, have a 15-inch face. There is a roller chain drive to travel from the differential. All wheels are mounted on Timken roller bearings and there is high under-axle clearance permitting its operation in rough terrain.



The Byers Model 50 Excavator



The Seal-Tite Bolt

A New Idea in Bolts

A NEW Seal-Tite bolt especially designed for wood construction of all kinds has just been placed on the market. This bolt, as shown in the accompanying illustration, has several unusual features which make it particularly adaptable for almost any industry where wood construction is a factor. The bolt is equipped with four fins on the shank beneath the head which serve to hold the bolt from turning. The fins are so designed that the surface of the fin which bears against the wood in tightening the bolt is on a radial plane. This produces the maximum holding power against turning and does away with the splitting action due to the wedge or inclined plane effect of a countersunk square head bolt.

The head of the bolt is sufficiently thin to countersink flush with the surface of the wood. The pressure of its tapered surface against the wood fibre is said to produce a water tight connection. The bolts are easily driven into the wood with an ordinary hammer. They are available in sizes ranging from ¼-inch in diameter to ¾-inch across with lengths running from one inch to any size desired. The Seal-Tite bolt is manufactured by the Lewis Bolt & Nut Co., Minneapolis, Minn.

USE THIS SERVICE — IT'S FREE

These especially selected catalogs and pamphlets of value to contractors are for free distribution. You will find it worth while to check these lists each month and write for the catalogs you need.

Hand Squeegee for Applying Filler to Brick

Literature which may be secured on request from Littleford Bros., 485 East Pearl St., Cincinnati, Ohio, describes the No. 82 squeegee machine which performs two operations at one time in that it distributes the asphalt and squeegees the material over the surface of the brick.

A Truck-Mounted Excavator

Literature describing the Model 50 Byers ½-yard excavator mounted on rubber-tired wheels and with a motor truck type of steer, motor transmission and differential, is available on request to contractors from the Byers Excavator Co., Ravenna, Ohio.

A Clamshell Bucket With Roller Bearings

The George Haiss Mfg. Co., 142nd St. & Park Ave., New York, will gladly send complete data regarding the 1931 model of the Haiss Hi-Power bucket in which the sheaves are equipped with Hyatt roller bearings which are protected by means of rings and grease seals.

A Heavy-Duty Pipeless Hydraulic Hoist Dump Body

An hydraulic hoist dump body which has no piping or connections to blow out, leak or give way under the vibration of the trucks, has been announced by the Anthony Co., Inc., Streator, Ill., who will be pleased to send complete information regarding the body on request.

A New Shoulder Finishing Machine

Complete data regarding the new Insley shoulder finisher which consists of a platform mounted on pneumatic tires, the platform carrying an A-frame and column supporting a set of blades which conform to the required specifications and which is made in three sizes and drawn by a tractor traveling on the shoulder, may be secured on request from the Insley Division of the National Equipment Corp., Indianapolis, Ind.

Pavers and Road Pumps

Catalog No. 206, a 36-page booklet describing the Rex Champion paver and road pump for use in road construction, will be sent to interested contractors on request by the Chain Belt Co., 1666 West Bruce St., Milwaukee, Wis.

Cast Iron Headwalls for Culverts

A cast iron headwall, especially designed for use with Spi-Cor spiral corrugated cast iron culvert pipe, is made by the American Casting Co., Birmingham, Ala., and described in literature which may be secured on request.

A Two-Fire Dryer for Portable Asphalt Plants

A two-fire dryer which revolves on steel tires and rollers placed close to the front or feed end and to the discharge end and which is gear-driven, has been announced by the F. D. Cummer & Son Co., Cleveland, Ohio, and is described in literature which may be secured on request.

Modern Paving Methods

This is the title of a 96-page catalog issued by the American Vibrolithic Corp., Des Moines, Iowa, describing Vibrolithic pavement, a list of communities where it has been constructed, methods of construction, a comparison of transverse and compressive tests of concrete, effect of moisture in sands in proportioning concrete mixtures, correction table for bulking of fine aggregate due to moisture, helpful hints and short cuts for engineers and tables of quantities of materials for concrete of various proportions.

New Concrete Breakers

Bulletin 87-G, describing the two new Sullivan K-5 and K-6 concrete breakers, K-5 being designed for ordinary work and K-7 for unusually heavy conditions, may be secured by interested contractors from the Sullivan Machinery Co., 814 Wrigley Bldg., Chicago, Ill.

A Manganese Steel Welding Rod

Complete information regarding the Amsco steel welding rod which may be used for repairing or building up either manganese steel castings or other steel and the Amsco 459 welding rod which has been found economical for hard-surfacing dipper teeth, pulverizer hammers and other parts subjected to severe wearing action, may be secured without obligation from the American Manganese Steel Co., Inc., Chicago Heights, Ill.

A Double-Unit Crushing and Screening Plant

The Diamond No. 60 double-unit crushing and screening plant which has two crushers, an 8 x 36-inch roller bearing jaw crusher for the primary and 22 x 14-inch rolls for reduction, is described in literature which may be secured without obligation from the Diamond Iron Works, Inc., Minneapolis, Minn.

A New Steel Curb

A folder describing Armco Metalcurb, a new steel curb made of two strips of steel, one on each side of the pavement, held together by strip steel tie rods running across the pavement at intervals and case of bituminous of brick resurfacing or in the asphalt in the case of bituminous resurfacing or construction, will be sent on request by the American Rolling Mill Co., Middletown, Ohio.

Specifications for ¾-Yard and 1-Yard Shovels and 10 and 17½-Ton Cranes

Bay City Shovels, Inc., Bay City, Mich., has issued its catalog RS-4, consisting of 20 pages and cover, containing specifications and data covering Bay City full-revolving Model R ¾-yard shovels and 12-ton cranes and Model S 1-yard shovels and 17½-ton cranes, with convertible attachments and full crawler mounting.

A New Model Earth-Boring Machine and Pole Setter

The Highway Trailer Co., Edgerton, Wis., has just issued a new Bulletin describing the Highway Model C-30 earth-boring machine and pole setter which digs holes from 6 to 36 inches in diameter in frozen clay, hardpan, sand and shale and sets poles from 65 to 70 feet in length.

Road Forms for Road Work

The Blaw-Knox Co., 2067 Farmers Bank Bldg., Pittsburgh, Penna., will be glad to send to interested contractors literature describing the Blaw-Knox road forms which are easy to handle and set, simple in design and strongly constructed, have the rigid lock joint and staking system, and are interchangeable.

A Diesel-Engine-Driven Compressor

The use of the diesel engine as a power unit on a portable air compressor has been announced by Schramm, Inc., West Chester, Pa., who has described this automatic compressor in Bulletin 3105 which will be sent to interested contractors on request.

A Grader with a Versatile Blade

Ryan Manufacturing Corp., 13501 Baltimore Ave., Chicago, Ill., in its Bulletin 105B describes the Ryan motor-controlled leanable-frame grader which weighs 8,400 pounds and is built for use with tractors of 40 to 60 horsepower and which can be used with the blade extended to either side for shoulder work.

A New Type of Vibrating Screen

A screen, known as the Trayco Conveyanscreen, which brings a number of new and interesting practices to the art of screening, has been announced by the Traylor Vibrator Co., 1400 Delgany St., Denver, Colo., in its Bulletin No. S-102.

A New 6-Cylinder Power Unit

Complete information regarding the new P-640 power unit recently announced by the Continental Motors Corp., Detroit, Mich., will be sent on request to contractors interested in this unusually compact 6-cylinder power unit with 214.7-cubic inch piston displacement which develops 40 horsepower at 1,600 revolutions per minute.

A New Road Grader and Maintainer

Complete information in regard to the new Wood road grader-maintainer, a dual-purpose machine which may be used as a pulled grader or a powered maintainer, may be secured by interested contractors from L. C. Wood & Co., Alden, Iowa.

Handbook on Concrete Construction

Useful and up-to-date information on concrete, both plain and reinforced, is contained in the new "Handbook of Concrete Construction" just issued by the Universal Atlas Cement Co., subsidiary of United States Steel Corp., 208 South La Salle St., Chicago, Ill. The book has 208 pages, is well-illustrated and contains 48 accurate, easily-read tables on quantities, sizes, loads, etc.

An 11-14-Cubic Yard Hopper-Type Trailer

Complete information in regard to the new Athey 11-14-cubic yard hopper-type rear dump trailer which spreads material as it dumps at a depth of from 6 to 18 inches may be secured from the Athey Truss Wheel Co., 130 North Wells St., Chicago, Ill.

Spreading Base Rock Mechanically

Literature describing the Handy Rol-Roc, a machine designed for practical road conditions, which spreads a uniform layer of rock of any size or mixture of sizes, requires a minimum of hand labor, does not disturb the soft base of the road and takes a minimum of power to draw it, may be secured from Highway Service, Inc., New Bedford, Mass.

A New 3-Yard Diesel Dragline

Bulletin B-1111 describing the new Bucyrus-Erie Class 111 3-yard diesel dragline which offers the economy and power of a 6-cylinder full-diesel engine combined with fast operation, accessibility, ease of control and freedom from repairs will be sent on request by the Bucyrus-Erie Co., South Milwaukee, Wis.

Complete Ready-Mixed Concrete Plants

The new S-A system for automatically accomplishing the accurate proportioning of the concrete batch for central mixing plants is of interest to those considering this new commercial project, and who may secure a copy of the new 10-page booklet, describing complete plants and equipment for producing ready-mixed concrete, from the Stephens Adamson Mfg. Co., Aurora, Ill., on request.

A Surfacer for Concrete and Concrete-Asphalt Highways

The Concrete Surfacing Machinery Co., 4557 Spring Grove Ave., Cincinnati, Ohio, will be glad to send to those interested complete information in regard to the Berg Hi-Way surfacer, which rapidly grinds down the high spots on new concrete or concrete-asphalt highways.

A ¾-Yard Shovel with Finger-Tip Control

The Michigan ¾-yard power shovel, among the features of which are three-quarter digging, full circle loading, no tailswing and finger-tip control on three levers to operate the machine, is described in Bulletin C which may be secured by interested contractors from the Michigan Power Shovel Co., Benton Harbor, Mich.

A Portable All-Steel Jaw Crusher

Complete information in regard to the Day portable all-steel force feed jaw crusher which is attached to a Caterpillar tractor, is practical in all weather, saves hauling material to the job and handles the hardest field stone or ledge rock, may be secured by those intereested from the Day Pulverizer Co., Knoxville, Tenn.

Portable Air Compressors

Metalweld, Inc., 26th St. and Hunting Park Ave., Philadelphia, Penna., will be glad to send to those interested complete information in regard to Metalweld-Worthington portable air compressors, among the features of which are feather valves, full force feed lubrication, a power unit with long-life oil cooling and filtering design and electrically welded rolled steel frame.

A Handbook of Pipe Specifications

The deLavaud Handbook giving full details and specifications of deLavaud pipe, which is light in weight, durable and easy to cut and tap, may be secured by those interested from the United States Pipe & Foundry Co., Burlington, N. J.

Serviceable, Long-Wearing Tractors

Allis-Chalmers tractors, the dirt-sealed truck wheel construction of which is one of the features built into these tractors to combat mud, sand, dust and other severe operating conditions, are described in literature which the Allis-Chalmers Manufacturing Co., Monarch Tractor Div., Milwaukee, Wis., will be glad to send on request.

Trailers for Construction Equipment

Rogers low deck carry-all trailers for transporting construction equipment are described in Catalog No. 28 which Rogers Brothers Corp., 108 Orchard St., Albion, Penna., will be glad to send to those interested.

Pumps for Every Pumping Problem

A booklet entitled "A Way to Save Money on Your Next Wet Job," prepared by a prominent hydraulic engineer to assist contractors in securing the most efficient pumping equipment for unwatering work, as well as literature describing Humdinger pumps for all types of pumping problems, may be secured from the Ralph B. Carter Co., 192 Atlantic St., Hackensack, N. J.

27-E Pavers for Road Contractors

Ransome 27-E Master pavers which are new, up-to-date and built for long life are described in Bulletin 125 which the Ransome Concrete Machinery Co., Dunellen, N. J. will be glad to send to interested road contractors.

Tarpaulins and Tents

Complete information in regard to Fulton quality tarpaulins and tents which can be depended upon in all kinds of weather to give protection to materials, equipment and workmen may be secured by those interested from the Fulton Bag & Cotton Mills, Atlanta, Ga.

A Complete Line of Mixers, Hoists and Towers

Catalogs describing the 1931 Jaeger mixers, towers and hoists in all sizes and styles to meet every construction need may be secured by those interested from the Jaeger Machine Co., 701 Dublin Ave., Columbus, Ohio.

A Sturdy ½-Yard Shovel

General Excavator Co., 220 Rose St., Marion, Ohio, will be glad to send to those interested a complete description of the General ½-yard shovel, the dipper of which is constructed of cast steel back and hinges, heavy lip, reinforced shell and two-part reversible manganese steel teeth.

Rock Drills and Other Pneumatic Machinery

Hardsoog Wonder Drill Co., Ottumwa, Iowa, will be glad to send to interested contractors a complete description of its line of Hardsoog Wonder rock drills in nine different sizes to meet any requirements, as well as paving breakers, clay spades, drill steel, air hose and pneumatic sharpening and shanking machines.

Clarifiers for Use in Sewage and Water Treatment

Bulletins 6001 and 6101 describing the Dorr traction clarifier which is so constructed that it concentrates the sludge as it sweeps the settled solids toward the central discharge zone will be sent on request by the Dorr Co., 247 Park Ave., New York City.

An Improved ½-Yard Shovel

Literature describing the improvements recently made in the crawlers and driving mechanism of the Speeder Model B3 ½-yard shovel may be secured by those interested from the Speeder Machinery Corp., Cedar Rapids, Iowa.

A New Device for Removing Oil and Water from Air Lines

Motor Improvements, Inc., Newark, N. J., will be glad to send to those interested literature describing the Purolator air separator, a new device for removing oil and water from compressed air lines.

A New Multiple Material Weigh Batcher

The new Johnson multiple material weigh batcher for truck batching which was designed especially to be used where specifications require the proportioning of two coarse and one fine aggregate in one hopper is described in literature which the C. S. Johnson Co., Champaign, Ill., will be glad to send to interested contractors.

Working in the Dry

The Moretrench Corp., Rockaway, N. J., has just issued a very helpful 59-page catalog which is a veritable textbook on the uses of the Moretrench well-point system which makes it possible to handle all kinds of excavation in the dry. The illustrations and diagrams cover a great variety of work, making the catalog very helpful to contractors faced with the problems of keeping excavation dry. A copy of the catalog will be sent to you free on request.

Hose and Other Rubber Requirements for Contractors

Literature describing road builders heavy duty water and steam hose, pile driving hose, welding and cutting hose, sand suction hose, pneumatic tool hose, pump diaphragms, packing and gaskets, rubber valves, rubber gloves, mittens and boots and oiled clothing, as well as Hi-Pressure jet or water hose, may be secured on request from the Continental Rubber Works, Erie, Pa.

A New Wheelbarrow Scale

Fairbanks, Morse & Co., 900 South Wabash Ave., Chicago, Ill., will be pleased to send complete information regarding its new wheelbarrow scale for weighing wheelbarrow loads of ingredients for concrete. The scale is provided with a tare bar and two beams, one for sand and one for stone, so that all weighing can be done on one scale.

Street and Sewer Castings

Campbell Foundry Co., Harrison, N. J., manufacturers of manhole heads and covers, catch basin heads and inlets, drainage castings, culvert plates and grates, subway castings and curb protectors will gladly send data and prices on request.

Distribution with Separate Pump

Catalog 503 of E. D. Etnyre & Co., Inc., 85 Jefferson St., Oregon, Ill., manufacturers of flushers, sprinklers and oil, tar and asphalt distributors, describes the Etnyre Model F distributor, a separate engine-driven pump type distributor for the application of all grades of oil, tar and asphalt used for bituminous road construction and maintenance.

Road Grader for Use with Small Tractor

Bulletin W-31-E, describes the Western No. 37 road grader which is sold by the Austin-Western Road Machinery Co., 400 North Michigan Ave., Chicago, Ill., for operation with any small tractor as a one-man maintenance unit.

A New Heavy-Duty Crawler Tractor

Literature describing the new Model GH Trackson McCormick-Deering heavy-duty crawler tractor, designed especially for the mounting of shovels, bulldozers, snow plows, pipe booms, hoists, cranes and similar equipment and suited to all kinds of highway and contracting operations, may be secured by those interested from the Trackson Co., 1323 So. First St., Milwaukee, Wis.

An Improved 1¼-Yard Gas-Electric Shovel

The Marion Type 450, 1¼-yard gas-electric shovel which has a number of new and improved features is described in literature which the Marion Steam Shovel Co., Marion, Ohio, will be glad to send on request.

Hydraulic Dirtmovers

Bulletin No. 131, describing the Ateco hydraulic dirtmovers which are accurately controlled, carefully designed and sturdily made, and are suitable for road building, excavation jobs and airport construction, may be secured by those interested from the American Tractor Equipment Co., Oakland, Calif.

A New Tractor Dump Wagon

The Ohio Locomotive Crane Co., Bucyrus, Ohio, will be glad to send to interested contractors literature describing the Ohio tractor dump wagon, with a capacity of from 3 to 4 yards, among the features of which are accessibility, simplicity and ruggedness.

A New Line of Motor Trucks

Complete information on the new line of motor trucks including 29 distinct models of various capacities from ¾ to 12 tons in a broad array of wheelbase lengths in bevel, worm, double reduction, chain and dual drives for commercial and dump hauling, may be secured without obligation from the Sterling Motor Truck Co., Milwaukee, Wis.

New Small, Heavy-Duty, 6-Cylinder Engines

A new line of heavy-duty 6-cylinder L-head engines designated as the JX series, the three models being made with bores of 3⅜, 3⅝ and 3⅞ inches and uniform strokes of 4½ inches, has been announced by the Hercules Motors Corp., Canton, Ohio, from whom complete information and prices may be secured on request.

Leaning Wheel Graders

Form SL867 of the Caterpillar Tractor Co., Peoria, Ill., describes the Caterpillar Sixty leaning wheel grader, with which it is possible to reach 8 feet high into a bank and cut a 60-degree angle. The booklet, which is well illustrated with large photographs showing the machine at work, will be sent on request.

Diesel Engines

Vertical 4-cycle, direct-injection Type B diesel engines, designed for continuous, economical performance covering the 50 to 150-horsepower range, are described in an 8-page Bulletin, No. S-500-B5, which may be secured on request from the Worthington Pump & Machinery Corp., Harrison, N. J.

A Balanced Power Grader

A non-skid balanced grader powered with standard industrial tractor and equipped with a multi-wheel drive, giving added tractive power, has been announced by the Rome Manufacturing Co., Grader Dept., Rome, N. Y., and is described in Rome Bulletin No. 25.

Three-Ton Heavy-Duty Trucks

A heavy-duty 3-ton commercial truck built from the ground up for the practical use of pneumatic tires and equipped with surplus power for weight, speed and acceleration, faster running speed, easier steering and effective brakes, is described in Form No. 360 of the Reo Motor Car Co., Lansing, Mich.